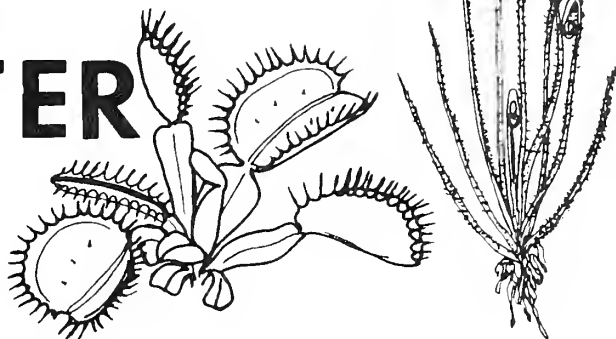




CARNIVOROUS PLANT NEWSLETTER

VOLUME V, NO. 1

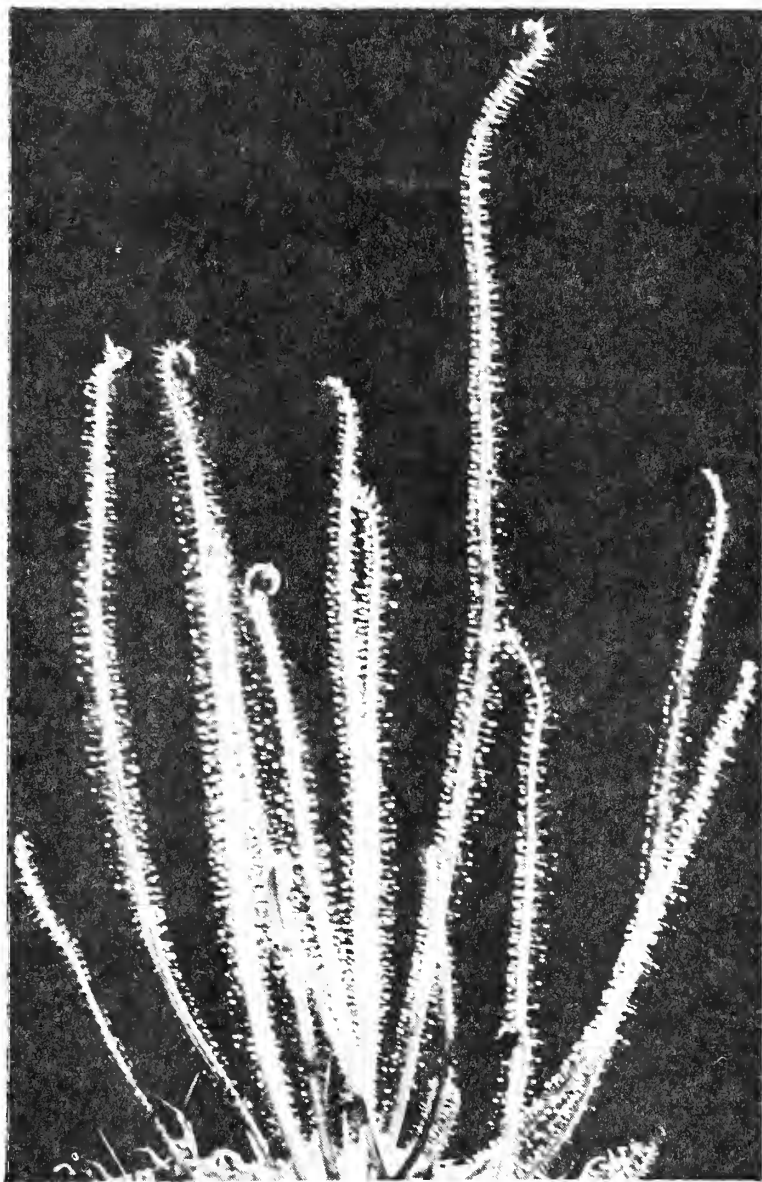
MARCH, 1976



CO-EDITORS: D. E. Schnell, Rt. 4, Box 275B, Statesville, NC 28677 USA
J. A. Mazrimas, 329 Helen Way, Livermore, CA 94550 USA

SUBSCRIPTION:

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DROSERA FILIFORMIS F. TYPICA

The smaller, red-glandular form found abundantly in New Jersey, and in more widely scattered areas south into North Carolina and recently described around a lake in the Florida panhandle.

Photo by A. ROGER KIRBY

NEW YORK
BOTANICAL
GARDEN

We welcome all new subscribers to CPN, and welcome back those who have renewed. Last year, the newsletter became so popular that we found it necessary to close subscriptions at 450 about halfway through the year since subscriptions are by the volume. This year, we have planned much larger printings and predict an ultimate number of 600-650 subscribers. Clearly, CPN has grown over its four years and this growth is a measure of interest on the part of amateur and professional botanists alike. We would like to re-emphasize that CPN is your newsletter and we solicit your news contributions. Newcomers will see the relative lengths and styles of the various categories of news and articles in this number. As always, the new subscription cost will just about cover printing and mailing expenses--the co-editors realize absolutely no profit and, in fact, we cover small deficits now and then.

Below we have listed two well-developed CPN services available to all subscribers. In addition, we are in the beginning stages of two additional projects which we hope will mature this year: (1) A revised worldwide species listing similar to the one now in print but with the addition of chromosome numbers (when known) and some salient descriptive characters. (2) A 35 mm. photostatic lending library. Someone is already hard at work on this and as soon as he is permanently settled in a new location, we will offer something definite on it--likely this year.

CPN SUBSCRIBER SERVICES

SEED AND PLANT EXCHANGE: BOB ZIEMER (1740 Stewart Avenue, Arcata, CA 95521) has been doing a superb job of handling this difficult service for us for several years now. In addition to providing a clearing house for growers to exchange material and correspondence, the printed computer lists are also valuable records of what is being grown. We regard both these functions as equally important. To join the exchange, send the following to Bob at his address above: (1) A complete list of all carnivorous plants you grow, whether or not you have anything to exchange. You do not have to have anything to exchange to join and receive the twice yearly printout. But if you do have material to exchange, so mark it on your list and indicate whether seed, plants or cuttings. (2) We request that you include \$.50 to \$1.00 for Bob in order to help him with postage and printing costs--the actual service is free and Bob handles it for us in what little spare time he can find. With this in mind, please be patient in awaiting replies to all correspondence with him. As an exchange member, you will receive twice yearly a computer printout in two parts: a list of names and addresses of all members and their list code numbers, and the actual species list followed by the code numbers of the growers and markings indicating what they have to exchange. With this information at hand, you will be able to see who is growing a plant you wish to acquire, who has material to exchange, and by means of a simple cross-check whether or not they have a particular species in their collection which you could offer in trade. Handle all trades by direct correspondence with the individual. There is an important caution or two: DO NOT inquire about a trade unless you actually have material to trade, and DO NOT inquire about a trade unless the list indicates that the grower is willing to trade a particular species. The last is very important since several growers of rare species who do not have sufficient material to trade have threatened to leave the exchange since they were so pestered by requests and even outright demands! The exchange has worked very well so far and will continue to do so as long as common courtesy is used.

COMPUTERIZED CARNIVOROUS PLANT BIBLIOGRAPHIC SERVICE--THE KWIC SYSTEM: LYNN MACEY (511 North Eby, McPherson, KS 67460) originated this exciting new project and is managing it very well. We have seen complete printouts of all the bibliography in storage thus far and the results are fantastic. What he has done is store all available bibliographic references to carnivorous plants in citation form along with rather complete summaries where they could be obtained. The co-editors get a lot of mail inquiring into carnivorous plant literature and this service is the answer. Lynn is one of many of you who did not have access to a complete botanical library or in-depth literature citations, so he very effectively decided to do something about it. This service will not only be useful to anyone working on a specific project, but also to anyone who wishes to develop a thorough CP bibliography. There is a variety of printouts, including routine alphabetical author, genus, species, special subjects such as ecology, growing tips, etc. Lynn will send a complete description of the system along with the sample printouts if you request it and send him a SELF-ADDRESSED ENVELOPE WITH TWO FIRST CLASS STAMPS. He only charges his actual cost in postage, paper and printing--his efforts and the computer time are voluntary. By the way, Lynn soaks up new material to add to his computer storage like a sponge. Many citations still need summaries of the complete nature he prefers (even to the listing of all species in entire books!) since they are from foreign or otherwise unavailable sources, and he requests reprints of all CP material published by any of our subscribers, future, current and past. So go through those old stacks of reprints and keep Lynn in mind when mailing out reprints of any future papers. Send for his synopsis today--you will be pleased (do not forget the envelope with two stamps).

AN EDITORIAL STATEMENT ON CONSERVATION AND CPN

The co-editors have always maintained a strong personal attitude of conservation of carnivorous plants. The following comments will apply mainly to U.S. plants since these are closest to us and others who have expressed greatest concern, but these ideas would be as applicable to non-U.S. species in their native settings.

Many of our subscribers and some critical non-subscribers feel that "unreasonable" publicity about CP will do more harm than good, and they point as evidence to several short notes that seem to describe veritable bacchanals of collecting and molestation of native CP stands by perhaps overly enthusiastic neophytes. Further, some exact locations, when they seem pertinent to the article, have been given (but many formal journals and all herbarium entries require exacting location information which is available to all!). Others object to the whole idea of plant rescue as a valid and viable procedure of saving plants in immediate danger from highway, industrial, housing and agricultural development. Finally, some see a paradox in our publishing an annual listing of commercial CP sources--some of whom are well known to collect from the wild to fill orders as they come in rather than truly propagate their stock.

Our comments on these very real problems may allay much suspicion or simply fan it into more rage. In either event, we would like to put forth our viewpoint. Be forewarned that this viewpoint is made more complex by an intermingling of what we also feel is the right thing to do regarding conservation of CP, and what we owe our readers as editors. Neither of us has ever felt that "hiding the cookie jar" was an effective way to develop a mature, balanced and reasonable conservation attitude. We must continue to have the basic editorial attitude of presenting all reasonable material sent to us for publication in CPN, and readers can then exercise their rights of personal judgment. We do impose limits of reasonable accuracy and general literacy. Personal communications from infrequent correspondents whom we do not know well sometime bear the notation "not for publication in CPN", and we have always and will continue to honor this request.

Concerning the commercial sources list, we have always stated that this is a reader service to do with as the reader wishes, exercising his own personal judgment, but that we do not endorse or support any of the firms listed. We believe this a sufficient disclaimer. That there are unprincipled dealers on the list who collect, or order the collection of, carnivorous plants from native sources by the thousands each year, is sadly well known to us. The notation by some dealers in their catalogues "sent to us by our southern *growing* sources (*italics ours*)" is one of those cynical statements about which we have no illusions. If the Smithsonian list is finally approved by the Department of the Interior--and it seems very likely that it soon will be--then it will become a federal offense to ship or carry interstate any CP on the list. But not all U.S. CP are on the list, so this solution is only partial. However, beginning with this annual commercial sources list, we will list first and so mark those commercial dealers (only two so far) that have of their own accord written us a letter stating that all CP they sell will have been propagated by them, or obtained from a source which they are sure also propagates them. Such letters have been and will continue to be unsolicited and we will insist on knowing the dealer, proofs and guarantees. Again, the marking of such dealers who state that their material has been propagated does not constitute an endorsement of the dealer or the quality of his goods and service. We hope this new policy will help encourage an appropriate response at both ends of the dealer-customer relationship.

We have always felt, and are supported by several studies to this effect, that habitat destruction and commercial exploitation were the greatest dangers to CP locations. Vandalism by individuals, while deplorable in itself, is not a serious threat except in the cases of rare species and forms, an example being Sarracenia rubra ssp. jonesii. In such cases, we will not publish exact locations. Further, if the co-editors do have exact knowledge of rare plant locations as a result of our voluminous personal correspondence, we will not disclose these to any other of our personal correspondents. Such requests will be referred to the original informant to handle as he wishes.

We believe that in carefully judged situations plant rescue operations by responsible groups are a vital method of saving valuable material. While the Smithsonian report properly expresses the concept that such translocations should only be temporary with the ultimate aim of replacing the rescued plants back into nature in the same or similar site, we feel that in most cases this idea is idealistic rather than realistic and that we must encourage native plant and botanical gardens habitat, a fine example of which is the North Carolina Botanical Garden in Chapel Hill. In addition to native settings and brilliantly contrived, flourishing habitat plantings, this active and enthusiastic organization is also developing "branch locations" by purchasing or accepting donations of good, easily secured (in the protective sense) botanical locations throughout the state. Our readers are encouraged to look into existing or embryonic organizations of similar character where they live and to participate in such realistic conservation efforts themselves.

For the future, we intend to embark on a more active and outgoing commitment to conservation through CPN. We hope this additional editorial activity will meet with reader approval and we encourage your comments.

NEW SUBSCRIBERS

J. H. JOHNSON, JR. (20948 Wilder Ave., Lakewood, CA 90715).
 RUMNEY ECOLOGICAL SYSTEMS (P.O.Box 90, Rumney, NH 03266).
 WILLIAM S. FRAZIER, JR. (Box 1083, ISU Station, Ames, Iowa 50010).
 SUSAN ELLIS (3103 Keswick Road, Baltimore, MD 21211).
 J. COOPER (1025 Westwood Boulevard, Los Angeles, CA 90024).
 L. KILBERT (5601 Coomer Road, West Bloomfield, MI 48033).
 MICHAEL J. KRZYWONSKI (7622 Cartwheel Ln, San Antonio, TX 78227).
 GILBERT NASH (1524 W. Orangewood Ave., Anaheim, CA 92802).
 WILLIAM WOOD (11408 San Pablo Avenue, El Cerrito, CA 94530).
 JOHN T. CASH (Hodges Gardens, P. O. Box 921, Many, LA 71449) is horticulturist at the garden and would like to build the CP collection. He can trade local plants and some non-CP that readers may be interested in. All donations of plants are tax deductible. Write for particulars.
 TOM FENNELL, JR. (26715 SW 157 Avenue, Homestead, FL 33030).
 MRS. NINA M. WOESSNER (Rare Plant House, Fairchild Tropical Garden, 10901 Old Cutler Road, Miami, FL 33156).
 LEONARD PARKER (1325 Terrill Road, Scotch Plains, NJ 07076).
 MICHAEL NICHOLS (Route 1, Box 109E, Myrtle Beach, SC 29577).
 CARTER & HOLMES (P. O. Box 668, Newberry, SC 29108).
 MRS. PORTER D. SLAGLE (4909 Richland Drive, Raleigh, NC 27612).
 JON M. JONES (Dept. of Biology, University of South Carolina, Columbia, SC 29208).
 LAURIE A. BOYLAN (903 Caledonia, Cleveland, OH 44112).
 LOU STRAF (263 Yonge St., Toronto, Ontario M5B 1N8, Canada).
 GARY SANTINI (1039 Pinecrest Road, Annapolis, MD 21403).
 BRENT BRIDGES (2345 S. 4-Lane Hwy, Apt W5, Smyrna, GA 30080).
 MADAM U (GPO Box 2817, Hong Kong).
 KAREN A. SCHRYVER (210 S. Parsons, Brandon, FL 33511).
 VICKI LORENZ (13201 Clayton Road, St. Louis, MO 63131).
 ROBERT GOODMAN (20 Seville Lane, Stony Brook, NY 11790).
 AUDREY E. GOINS (Department of Zoology-Entomology, Auburn University, Auburn, AL 36830).
 F.V.C. GOOCH (The Mount, 27 Castle Lane, Bohsover, Nr. Chesterfield, Derbyshire, England).
 MARK HARDY III (716 Mills Street, Raleigh, NC 27608).
 CAROL TURNER (1428 Elgin Ct., Cary, NC 27511).
 MRS. BETTY DAUGHTERTY (529 Kennedy St., Juneau, AK 99801).
 BRYAN I. LORBER (Larch Tree Lane, Westport, CT 06880).
 DEAN JACKMAN (1520 Live Oak Drive, Tallahassee, FL 32301).
 JERRY W. DUPUY (Box 63, Barcelo Industrial, C. por A., Santo Domingo, Dominican Republic, W.I.).
 JEFFREY DEL COL (957 Maple Dr. #10, Morgantown, WV 26505).
 ANTHONY MIHALIE (14488 Rock Creek Road, Chardon, OH 44024).
 PAUL CASHMAN (Route 1, Crews Lake Drive, Lakeland, FL 33803).
 DAVID ELDER (419 Center Street, Pittsburgh, PA 15221).
 NEAL STEWART (807 N. Peace Haven Road, Winston-Salem, NC 27104).
 RICHARD FREDERICKSON (724 N. Peace Haven Road, Winston-Salem, NC 27104).
 ROBERT E. ENGEL (Biology, Marlboro College, Marlboro, VT 05344).
 MRS. C. CRAWFORD (1131 1/2 Manning Road, Hartsville, OH 44632).
 GEORGE MATTHEWS (55 McKinley Avenue, Colonia, NJ 07067).
 HELEN KUHN (20 Sherwood Road, Easton, CT 06612).
 DURLAND FISH (Department of Entomology, University of Florida, Gainesville, FL 32601).
 MS. DORIS MUNSTEREIFEL (Young Engineering Co., P. O. Box 50327, New Orleans, LA 70150).
 MARION T. FOX (1620 Bradshaw Garden Road, Knoxville, TN 37912).
 EDWARD ORRIS (14 S. Market Street, Mechanicsburg, PA 17055).
 THOMAS ROLF (Route 1, Box 144, Grasston, MN 55030).
 W.D. HELPHREY (1332 NW 188th Terrace, Miami, FL 33169).
 THOMAS E. BROWN (Div. of Science, Atlantic Community College, Mays Landing, NJ 08330).
 BARRY'S CARNIVORES (19811 NE 19th Avenue, N. Miami Beach, FL 33179).
 JOHN M. FOX (6615 Markham, Little Rock, AR 72205).
 MISS ELEANOR F. ARMSTRONG (51 Elliott Pl, Rutherford, NJ 07070).
 ANDY LANIER (901 N. Greene Avenue, Lake Worth, FL 33461).
 DEWEY G. MEYERS (Dept. of Zoology, Birge Hall, University of Wisconsin, Madison, WI 53706).
 RON JENNINGS (713 J. Clyde Morris Blvd., Apt 9H, Newport News, VA 23601).
 LIBRARY, MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION (8787 Georgia Avenue, Silver Spring, MD 20907).
 RICHARD HALVORSON (Pacific Tropical Botanical Garden, Lawai, Kawai, HI 96765).
 CLAIRE PATTERSON (307-B Cheswick CIR, Cary, NC 27511).
 JOE M. HATLEY (Route 2, Box 141, Conover, NC 28613).
 TOM TINDALL, Principal (Mars Middle School, Route 2, Mars, PA 16046).

C. B. BOYER (P. O. Box 251, Dabel Station, Dayton, OH 45420).
 DON BURDEN (Route 3, Box 219, Floyd Knobs, IN 47119).
 JEROME P. ROSENTHAL (23470 Kenosha, Oak Park, MI 48237).
 ALLAN SHIPP (5616 Sonoma Road, Bethesda, MD 20034).
 PETER BALASSA (360 Nuttall Road, Riverside, IL 60546).
 PAMELA LILLQUIST (U-42, Botany Greenhouse, University of Connecticut, Storrs, CT 06268).
 STEVEN A. FROWINE (37840 Jackson Road, Chagrin Falls, OH 44022).
 PHILLIP SHERIDAN (5729 S. 2nd St., Arlington, VA 22204).
 RICHARD M. GLANTZ (225 Shady Lane, Downers Grove, IL 60515).
 GEORGE P. SPAGNVOLO (610 W. Saginaw, Lansing, MI 48933).
 WILLIAM L. TICKNOR (6611 Lawndale Drive #201, Falls Church, VA 22042).
 WILLIAM O. TICKNOR (2814 Greenway Boulevard, Falls Church, VA 22042).
 W. C. HENDRICKS (5511 Clinton Drive, Erie, PA 16509).
 ALICE CORNEAL (3270 Isadora Drive, San Jose, CA 95132).
 CHARLES MARS (222 S. 7th Street, Grand Junction, CO 81501).
 PETER MCINTOSH (621 Idlewyld Drive, Ft. Lauderdale, FL 33301).
 HENRY T. BURNLEY (10140 Calumet, Chicago, IL 60628).
 RENO C. UNGER (Rt. 2, Box 366, Kutztown, PA 19530).
 EDWARD STILE (981 Twin Silo Lane, Huntingdon Valley, PA 19006).
 JACK HAMBURGER (36 Keans Road, Burlington, MA 01803).
 C. E. KOLB (419 Conduitt Road, Mooresville, IN 46158).
 MRS. E. J. SPRATT, JR. (1301 Third Avenue, New Brighton, PA 15066).
 MRS. M. SCHLERETH (10262 Hobkirk Drive, St. Louis, MO 63137).
 MRS. ALMA BAUGH (12105 Aldine Westfield Road, Houston, TX 77016).
 GARY KATZ (11403 Cloverhill Drive, Silver Spring, MD 20902).
 LUCIEN J. RAINVILLE (446 Morgan Drive, Lewiston, NY 14092).
 RENEE REYNOLDS (781 Arkansas, Tallahassee, FL 32304).
 RANDY COUSINS (2777 Hill Road, Vienna, VA 22180).
 CHRIS WILLIAMS (Box 664, New York City 10035).
 J. G. MUIRHEAD (3210 Main Street, Riverside, CA 92501).
 RICHARD J. DAINES (519 Bloomfield Avenue, Apt. 3K, Caldwell, NJ 07006).
 KENNETH M. JOHNSON (1511 Green Street, Tallahassee, FL 32303).
 TERRY L. STAWAR (1220 Willis Avenue, Daytona Beach, FL 32014).
 J. ZALARICK (1472 74th St. Ocean, Marathon, FL 33050).
 MRS. H. F. JORGENSEN (314 Lacey Drive, New Milford, NJ 07646).
 EVAN G. PERSON (142 Gray Avenue, Ames, IA 50010).
 R. S. INGWERSEN (1307 Gran Avenue, Palm Bay, FL 32905).
 MIKE POLYVAS (3420 W. 94th Street, Cleveland, OH 44102).
 RONALD GROSS (12 Commonwealth Ct., Apt. 13, Brighton, MA 02135).
 ARNOLD M. MONETT (27 Loring Street, Westwood, MA 02090).
 NEIL A. JOHNSON (1120 Chester Avenue, Apt. 237, Cleveland, OH 44114).
 JOHN NORDLINGER (169 Main Street, Townsend, MA 01469).
 IRVING THOMAS, JR. (2163 Eden Street, Ft. Wayne, IN 46803).
 STEVE HAMMEL (700 Hwy. 121-A #125, Hurst, TX 76053).
 M. C. RUSSELL (41 Lusk Drive, Vermont, Victoria, Australia, 3133).
 DAVID MACK (10408 Lamar, Overland Park, KS 66207).
 JAMES EMRICH (517 Ewing Street, Fremont, OH 43420).
 JANE E. YORDY (1025 E. Maple Street, Palmyra, PA 17078).
 PAUL A. GUILLOTTE (Sunset Drive, Williamstown, MA 01267).
 DR. ROBERT SPOCK (111 Cobalt Ridge Drive, N., Levittown, PA 19057).
 LOUIS DORAZIO (26 Potomac Road, Warwick, RI 02888).
 KIRK W. STEIJN (2503 Teal Road, Wilmington, DE 19805).

(New subscribers not appearing in this list probably arrived too late for inclusion and will appear in the next issue.)

NEWS AND VIEWS

ERROR CORRECTION: In the short note on plant growth substances and *Byblis gigantea* seeds appearing in the preceding issue (CPN 4:66-67, 1975), one of the hormone mixtures was listed erroneously due to typographical error. In set 3, Kinetin was also present to saturation at 25 C along with the K-GA, thus accounting for the difference in germination rate over set 5.

We have received a very light response to our poll on public gardens having CP displays. The apparent reasons are mainly two: very few gardens have CP displays, and those that do have often experienced so much vandalism that many now keep their CP in locked, publicly inaccessible greenhouses. However, most of the latter will admit CPNers upon request and accompanied by an attendant. We will list what gardens and conservatories we have next issue so that those who are late in renewing will have a chance to respond.

STANWYN SHETLER sent us a copy of a letter stating that the Suitland Bog in the Washington, D.C. area has been preserved and will be fenced off as part of a park. Bob Czerwony first mentioned that he felt the bog was endangered in a CPN note (CPN 4:68, 1975) and that a stake indicated impending construction of an extension of a nearby apartment complex. Dr. Shetler states that stake is part of a survey for the new park. Therefore, any "rescue parties" should be called off and no plants removed from the bog. The bog will be susceptible to misguided efforts to remove plants from it in order to save them from construction until a new fence is complete. In the meantime, we urge all subscribers not to disturb the site, and to discourage others from doing so.

DR. EDGAR T. WHERRY sent us a note describing an early use of Sarracenia flava rhizome extracts for treatment of a painful neurologic disorder known as tic douloureux. When collecting of plants was halted in the south by the collectors having been drafted into World War II, the dealer came to Dr. Wherry for locations of northern S. purpurea as a substitute, which worked as well. Since then, newer synthetic drugs have been substituted. Dr. Wherry emphasized that he was very exacting in advising the drug collector to remove only widely spaced plants and none near the margins of the bog so that vegetative and seed renewal would occur. In a few years, the Sarracenias indeed had recovered completely in the bog.

DAVE DUBOSKY sent a letter complimentary to CPN and told of some of his experiences in the New Jersey Pine Barrens. "While in the cedar swamps, one thing that I often do is collect water for my plants (it is fine for CP). But care must be taken when going through the bog. Once, while visiting a site I know of near Whiting, New Jersey, my foot went through the sphagnum and I had a little trouble getting it back up!" Dave has read CARNIVOROUS PLANTS by John F. Waters (reviewed CPN 4:3) and says it is a beginning book but with very little cultural information. Dave would like to contact and correspond with anyone growing Cephalotus, Heliophora, Byblis, Drosophyllum, or Nepenthes. His address is 209 Pelican Road, Middletown, NJ 07748.

ROBERT FOLKERTS would like to add his concern over alarming reports of abuse and habitat destruction appearing more frequently in the pages of CPN. He wishes the reports continued since no matter how depressing they are, such news is necessary to encourage conservation efforts. During a recent field trip to the Gulf Coast, he noted marked reductions in numbers of Sarracenia as well as their quality. Disturbances in ground water tables apparently resulted in a very few small pitchers and a large number of phyllodia. However, large stands of S. leucophylla just west of Pensacola and mostly fenced seemed intact.

CARL E. FORST sends us a little note he found in Horticulture 52 (8): 56 (1975) that asks the question: "Do carnivorous plants really need meat to survive?" The answer was provided by a research project conducted at Cornell University in which a sundew was grown for eight years in complete isolation and without a single fly or meat. The plant survived because it manufactured its own food by photosynthesis although it would have grown bigger if it was furnished a diet of insects.

STEPHEN K-M TIM sent us a copy of a publication from the Brooklyn Botanic Gardens called Terrariums, publication number 78, volume 31, 1975. Running down the list of contents, one could find a description of every conceivable plant for terrarium culture including CP. The article on CP was written by Stephen and in six pages he describes the soil mixtures, plants and care throughout the year. This soft-cover primer is available by mail for \$1.50 (checks payable to Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, NY 11225).

The question has come up concerning what should actually constitute propagation in order for a commercial dealer to make the claim that he propagates (or obtains from one who does propagate) all the material he sells. Simply, propagated plants are those that have been in his nursery for two generations. Digging a large rhizome of Sarracenia flava from nature and dividing it into six pieces and then selling these pieces after they have rooted and sprouted is not propagation. But if that dealer allowed each of those six divisions to reach the same size as the original and then divided and rooted each of these, those products would have been truly propagated. Considering the large numbers of large rhizomes sold in this genus alone, along with the space required, we doubt that more than a small minority of plants marketed are truly propagated.

STEVE CLEMESHA writes: "I seem to be having better luck with pygmy Droseras this season. They are potted on a layer of sand with gravel on the surface and peat moss below the sand. I'm keeping them damp rather than wet by not letting them sit in water. I noticed a couple of small points omitted in the World CP list so I will list them: Sarr. x Willmottae = S. x Melanorhoda. Drosera burmanii extends to near Sydney so it is not only found in tropical Australia but in the temperate or maybe subtropical. Of course, Aldrovanda extends to Australia as well."

RICHARD CROSS writes: "Prior to leaving my CP for a two-week vacation, I noticed a trickle of ants entering one 10 gallon terrarium which was planted with several species of Sarracenia and Drosera in 6-7 inches of sphagnum moss. Upon my return, the trickle had become an eight-lane highway and sphagnum was now the new nest of a large fraction of ants. I noticed that the ants were succumbing by the thousands to the lure of Sarracenia; but where Drosera filiformis leaves snaked around on the surface of the sphagnum, the ants had built bridges spanning the sticky tentacles using dried pieces of sphagnum. They also used the pieces of dried sphagnum to build an entrance tunnel on the terrarium glass sides perhaps to avoid the moisture. I have since experienced similar ant attacks and have seen D. burkeana and D. capillaris defeated in the same manner."

PETER PRAGER wanted us to know about two books that deal in part with CP: Growing Exotic Plants Indoors by R. H. Menage, chapter 3. Henry Regnery Co., Pub. 1975. About \$4.95. Living Plants of the World, Second Edition, by Lorus and Margery Milne, Random House, Pub. 1975. On pages 91-96 and 222-223, this book shows beautiful color photos of Cephalotus, N. ampullaris and a few other CP. About \$20.00. Both books are available at your local book store. And, he noticed on one of his Pinguicula lusitanica plants, a stem grew from the crown of the plant and grew a new plantlet which sent down roots. He separated the two plants at the stem and both are growing fine.

Speaking of books, LARRY LOGOTETA came across this book in his local library which has portions showing beautiful pictures in color of various CP! Field Guide to the Alpine Plants of New Zealand by John T. Salmon. A.H. & A.M. Reed, Pub. 1968, about 326 pages. It shows Drosera spathulata, stenopetala, arcturi, binata, and Utricularia monanthos.

DENNIS HASTINGS writes in to say: "Some CP readers might be interested in this littlebit of information. For the last seven months I have been growing Nepenthes here in southern California using tap water with a total salt content of 750 p.p.m. without any ill effect. Also, at the suggestion of R. Sivertsen, I have been using two different types of plant food at their recommended strength. Both seem to be aiding pitcher and plant development. These plant foods are "Hy-Gro" orchid food (18-18-18) and "Watch Us Grow" (8-8-8). I prefer the latter one because it is not as strong as Hy-Gro and over a long period would not build up as much salt content in the moss. The only problem with Watch Us Grow is that it is not as readily available as Hy-Gro."

JOHN YOUNGER informs us that there was an article in Organic Gardening, November, 1975, pp. 108-110, the article titled "The Plants That Bite Back" by M. C. Goldman, which has a picture of a Venus flytrap. It is basically a general interest article with addresses of suppliers.

GEORGE JOHNSON informs us that there is an additional bookstore where one can purchase Darwin's book Insectivorous Plants, second edition: G. A. Bibby Books, 714 Pleasant Street, Roseville, CA 95678. Send 25¢ for a catalogue.

STANWYN SHETLER has written two articles on carnivorous plants for the newest edition of the Encyclopedia Britannica. It is the fifteenth edition. The plant families are described under two orders, the Sarraceniales and the Nepenthales.

GEORGE A. SERGEANT writes: "Following the remarks by Jim Chester in Vol. IV, No. 3 on spoon feeding of CP with captured insects, I think the alternative of artificial feeding with readily-available protein-rich food is worth consideration. I have found that Droseras in particular react with apparent benefit to small doses of dried skimmed-milk powder. The amount required must be judged by experience as overdosing can do more harm than good. No feeding at all should be the rule when the plants are not in active growth or are approaching the resting period."

LARRY DEBUHR writes: "I was interested in the illustration on the cover on this issue, so I did some library research with the help of our librarian, Mrs. Bea Beck. The library at Rancho Santa Ana Botanic Garden is very good and contains many historical works. I looked up the print in Smith's Exotic Botany, and indeed the print was not from this work. However, it was obvious that the print you illustrated and the print in Smith were very similar. The print you illustrated differed in that it lacked a second flower and an additional leaf that were in the Smith print. However, in all other respects your print was a simple reversal of the Smith print. After extensive searching through the library, we found a three-volume work by Richard Duppa entitled The Classes and Orders of the Linnaean System of Botany, published in 1816 in London. We found the plate you illustrated opposite page 266 in volume two. After further work we realized that all, or almost all, of the prints used in this work were in fact copies of prints from earlier works, particularly works by Smith with illustrations by Sowerby. The prints in the Duppa work were all reversed from the original prints, and most of them had parts omitted, i.e., leaves, flowers. Except for the missing parts, and the reversal of the prints, the

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copies were extremely good. Richard Duppa was not a botanist or illustrator by profession, but was the High Sheriff of Randor. He lived from 1770 to 1831. Credit Mrs. Beck with finding the origin of the print you illustrated."

SHORT NOTES

CONSERVATION ACTION FOR CARNIVOROUS PLANTS

by R. A. DeFilipps, Endangered Flora Project, Department of Botany,
Smithsonian Institution, Washington, D.C. 20560

Carnivorous plants often find themselves in the same position as cacti and orchids: they are too bizarre and beautiful for their own good. Merciless harvesters, such as those vividly described by Don Schnell in the September 1975 CPN, are removing populations of species that have already reached a low ebb in their passive battle for survival.

What a contrast such collecting is, compared to the beneficial work being done by the staff of the North Carolina Botanical Garden at Chapel Hill. There, Venus flytraps and pitcher plants are grown from seed and displayed in order to educate the public and show that many native plants can be propagated relatively easily, and should never be removed from their natural habitat unless imminently endangered by human activities. A discussion of their work has been presented by J. K. Moore and C. R. Bell, American Horticulturist 55:23-29 (Winter 1974).

In the Endangered Species Act of 1973 (Public Law 93-205), the Congress of the United States authorized and directed the Smithsonian Institution to review species of plants which are now or may become endangered or threatened and to review methods of adequately conserving such species. The result of this directive is a Report on Endangered and Threatened Plant Species of the United States, published by the Government Printing Office early this year. In it, the following carnivorous plants are listed as endangered or threatened on a national basis: Darlingtonia californica, Dionaea muscipula, Pinguicula ionantha, P. planifolia, Sarracenia oreophila, S. psittacina and S. rubra. David Lane has categorized them in the September 1975 CPN.

On July 1, 1975, the U. S. Department of the Interior published in the Federal Register a Notice of Review of the status of all plants listed in the Smithsonian Report. The Interior Department has thus obliged itself to the lengthy and time-consuming process of gathering and evaluating data in order to help in deciding whether or not to officially list the plants as endangered or threatened.

Their decisions will be based on such important criteria as the exact locality of the native populations, the acreage covered by them, the number of individual plants at each locality, and whether the populations have been increasing, are stable, or are decreasing at each locality. They also will need to know the nature of the threats to the species, whether it be land-clearing, drainage changes, or over-collection for sale, and specific examples of these threats.

Conservation-oriented readers of the CPN can be of great assistance by sending in any such data at their disposal to the Office of Endangered Species, U. S. Fish and Wildlife Service, Department of the Interior, Washington, D. C. 20240.

Once a species had been officially listed, the judgment will have the force of the Endangered Species Act of 1973 behind it. It will then be against the law to deliver, receive, carry, transport or ship in interstate or foreign commerce any such species without a permit issued by the Secretary of the Interior, and the Secretary is empowered under the Act to acquire land on which endangered species occur. Only through such a course of action will rapacious commercial collectors be deterred from wrecking the populations of carnivorous plants and their habitats.

FIELD NOTES ON CEPHALOTUS FOLLICULARIS IN WESTERN AUSTRALIA

by Larry DeBuhr

Cephalotus is an extremely interesting carnivorous plant that grows exclusively in the southwestern corner of Western Australia. It ranges along the south coast from Augusta to just east of Albany. Cephalotus is placed in its own plant family, the Cephalotaceae, and there is only one species known, Cephalotus follicularis.

There is apparently some confusion about the discovery of Cephalotus. The plant was first described by the French botanist Labillardiere in 1804. Labillardiere traveled to Western Australia aboard the ships La Recherche and L'Esperance in 1792. They had intended to land at King George Sound, now the site of Albany, but were carried farther east to the point now called Esperance. Esperance is about 250 miles east of the nearest known Cephalotus bog.

Although the source remains unknown, Labillardiere indicated in his description of Cephalotus that someone had given him the material which had been collected near King George Sound. (See Nelson, The collectors and type locations of some of Labillardiere's "Terra Van-Lewin" [Western Australia] specimens, Taxon 24 (2/3): 319-336, May, 1975.)

The southwestern corner of Western Australia is characterized by a Mediterranean type climate similar to that of California. The winters are cool and moist with the majority of rainfall occurring during the months of May to August. The summers are hot and dry, and a summer drought occurs between November and March or April. However, along the south coast where Cephalotus grows, more rain falls over a longer period of time than in the rest of southwestern Australia. This area usually receives a yearly average of 60 or more inches of rain. Temperatures are mild throughout the year and are seldom below 32° F. during the winter and very rarely above 100° F. during the summer.

Cephalotus grows in bogs that have dense, compact peat soil. This soil is formed by the accumulation of partially decomposed vegetation material. The soils in southwestern Australia are commonly leached; that is, when it rains, minerals are carried out of the upper layers of soil and accumulate in lower levels. The amount of leaching increases with increased rainfall, and soil acidity increases with leaching. When the average yearly rainfall reaches or exceeds 60 inches, the soil becomes heavily leached and peaty in nature.

Cephalotus bogs occur in low, depressed areas or along stream beds, and are often completely inundated with water during the winter and rainy season. The soil is extremely absorbent and acts as a gigantic reservoir. The bogs never completely dry out, although they may not have standing water all of the year. The soil is very acidic, and decomposition of vegetative material is slow.

Cephalotus has a thick fleshy rhizome which produces one or more rosettes of leaves each season. There are two types of leaves, several small spatulate leaves are formed first and are followed by the production of a number of pitcher leaves. The plants grow as low clumps since a single rhizome may form several rosettes or may branch with each branch forming a rosette. For more detailed descriptions of the structure of the leaves, see Erickson (Plants of Prey of Australia, 1968) and Lloyd (Carnivorous Plants, 1942).

In 1974 I had the opportunity to observe Cephalotus in its natural habitat. I saw the species growing in several peat bogs near Albany on the south coast. The first bog that I saw had been burnt the previous year, and dead, charred stems of shrubby plants stuck up from the peaty soil. The majority of these plants were sprouting from the base. A few Cephalotus plants were found growing in small clumps, apparently having survived the fire by means of the underground rhizomes. Growing with Cephalotus were Utricularia simplex and U. menziesii.

The next bog I visited was in a depression partially filled with water. There were several zones of vegetation around the bog. On the slopes leading to the bog was a low, dense, scrubby vegetation characteristic of the area. Immediately around the bog in a moist zone, but not within the bog, was an extremely dense stand of tall shrubs, small trees, and lots of reeds. This vegetation was only 5 to 10 feet thick but took several minutes to push through. The bog itself was much easier to move in. The vegetation was more open and composed of shrubs about 3 to 4 feet tall and had clumps of reeds and sedges scattered throughout. Standing water was present between raised tussocks of soil and vegetation. Portions of the bog vibrated when walked upon, giving the impressions of a quacking bog. Cephalotus plants were growing hidden from view in clumps at the base of the sedges, rushes, and shrubs. Growing with Cephalotus in this bog was Utricularia volubilis, a bladderwort that has a viny stem with large blue flowers at the top.

Other carnivorous plants that grow in similar bogs, often with Cephalotus, include Drosera hamiltonii and D. myriantha.

Cephalotus flowers in December and January, and since I left Australia in November, I did not have the opportunity to see the flowers of Cephalotus. The flowering time of Cephalotus is during the warmest and driest period of the year, a time when most plants have finished flowering. However, the excessive moisture of the bog enables the species to flower later in the year. It is my understanding that the majority of the plants do not flower each year. The mechanism inducing flowering in Cephalotus needs investigation, and may be nothing more than age or size of the plants. As with almost all carnivorous plants, a great deal of information on their natural history is yet to be learned, and this can only be done with extensive field research.

CULTIVATING CEPHALOTUS FOLLICULARIS

by David Kutt

My own experience with cultivating Cephalotus is confined to the past two and one-half years. During that time I have grown plants from rhizome portions and leaf cuttings with relative success regarding size and plant vigor.

My introduction to cultivating this plant came in early 1973 when several small rhizome portions were given to me by a friend. At that time, living sphagnum (his growing medium) was difficult to obtain in Ohio, so I used more easily obtainable dried fiber sphagnum. The plants did grow in this material, but although no loss of plants occurred, overall growth and development was very slow. The plants were treated basically the same as Sarracenia except for humidity which was kept higher at 75 to 85%, and more frequent misting. They were allowed to cool down to 45° or 50° F. in winter and even froze once or twice with no apparent harm to foliage or root systems. During winter, the lower temperatures accompanied by a shorter natural photoperiod caused production of the characteristic "winter leaves."

In the spring of 1974 the plants were carefully transplanted with all roots intact from their individual clay pots to a larger single tray of more shallow depth. This time they were planted in living sphagnum moss with better results evident later. I noticed when transplanting them that most of the plants had produced runners which were trying to work their way up the sides of the deep six-inch clay pots. As hoped, after transplanting them into the 2 1/2 inch deep tray, the new offshoots broke the surface much more readily. Then, rather than the plants' vigor being spent climbing the walls of deep pots, it was used to spread new vegetation across the surface of the tray.

The past year has seen equally good growth of Cephalotus utilizing unfertilized German peat as a medium rather than living sphagnum. I am not, however, out to make statements about superiority of either medium over the other. I have seen large, healthy plants growing in both materials. Interestingly, beginning in November of 1974, I began testing the effects of light fertilization on some of the plants. Initial feeding efforts of a year ago involved the use of fish emulsion (50% normal dilution) as the nutritive element in misting, watering, and pitcher feeding (once every two weeks). Although plant size began increasing, after four months the use of fish emulsion was discontinued due to its tendency to eventually "spoil" the potting medium even though containers were drained. I am now more successfully using an inorganic fertilizer produced by "Plantabbs". "Hy-grow", an orchid fertilizer has been producing larger pitchers and foliage as well as increasing the speed of development. I use this product at 3/4 normal strength on foliage and in the planting medium, and 1/2 strength in the pitchers. Care should be taken when putting nutrients directly in the pitchers since Cephalotus pitchers will rot off when too strong a dilution is used in them. The plants are fed once a month during their active growth cycle. Regular watering flushes the drained containers in the time intervals between feedings. Although living sphagnum tends to die easily with the addition of minerals and nutrients, the German peat usually just forms its own moss across the surface, preventing "watering splash" of potting material later.

Cephalotus light requirements are more similar to those of Nepenthes than Sarracenia in that they seem to prefer a more diffused type of light. As a general rule concerning pitcher size, more shade produces larger but less colorful pitchers. One can grow Cephalotus in a 50-60% shaded environment, then after several pitchers have developed, light can be slowly increased to "color-up" the foliage.

Although artificial nutrition may not be necessary for good growth, my own experience with cultivated plants here indicates that larger, more vigorous plants are produced by feeding. This comparison is made with non-fed plants grown in living sphagnum or German peat. Present plants here show one and one-half inch pitchers.

ON GROWING THE AUSTRALIAN PITCHER PLANT CEPHALOTUS

by J. A. Mazrimas

A single cluster or rosette of Cephalotus is a rather small plant in comparison to the pitcher plants of North America (Sarracenia) or Asia (Nepenthes). However, like some Sarracenia species, this plant produces two types of leaves--a flat, ovate-shaped one usually found in the center of the plant, and a small pitcher which grows at the end of a long stem which appears on the outer margins of the rosette. The flat leaves are usually produced at cool temperatures (around 50° F.) and short daylength while the pitchers are produced in warmer temperatures (around 75° F.) in the summertime.

In the field, Cephalotus grows on peaty soils that are constantly wet with seepage from above but is mostly found a few yards away from open water and definitely above the water table. In addition, the plants are virtually covered with an overstory of tall grasses and sedges which protects the plant from the hot, searing sunlight. These facts, then, give us some clue to how to cultivate the plant in our greenhouses or terrariums with a minimum of problems.

Old plants of Cephalotus form long underground stems that branch over long distances. Secondary plants arise at some distance from the parent plant. This natural tendency for the plant to propagate itself vegetatively from rootstocks provides some clue on how we could propagate the plant in cultivation.

I grow the plants in clay pots which are first filled about one-half full of horticultural grade perlite followed by a mixture of perlite and chopped live sphagnum moss (about 50-50 mixture). This is topped off with living moss so that it forms a small hill over the sides of the pot. This method provides good drainage which the plants must have. They do not like standing in water for any length of time. One can substitute German peat or ordinary peat moss and perlite or coarse sand if living sphagnum is not available.

I give about 1500 to 2000 foot-candles of light to the plants all day and supplement this with Wide-spectrum Gro-Lux light on an eighteen-hour day-night cycle. This seems to produce good, healthy growth of pitchers and after a month or so the green pitchers start to darken with red coloring first around the pitcher lip or peristome and then later the rest of the pitcher walls. In nature, the pitchers reach a length of 1 1/2 to 2 inches in height and this method of cultivation grows pitchers over one inch in height consistently.

During the growing season, I water the plants every other day since most of it drains through and this regimen seems to keep the plants from wilting and continuously growing. One of the first symptoms of overwatering Cephalotus is that some of the older pitchers will start to turn yellow and eventually turn orange-red and then brown. Sometimes, withholding water for a few days will reverse the trend and sometimes it is too late and all the pitchers will wither and fall off. Spraying with Benlate will prevent any fungus or mold rot in the meantime. Hopefully, new pitchers will grow out in time to replace those that were lost.

In the Northern hemisphere, plants will eventually bloom in July-August if season reversal was successful. The flower stalk is very tall but the flowers are small and inconspicuous. In my first attempt to self-pollinate the flowers, since I had only one plant flowering, I had no results on seed production. The seed is light brown, small and oval shaped. Propagating Cephalotus from seed is very difficult and uncertain because of the low rate of germination and the long wait required before germination. Further investigation of the mechanisms for rapid germination is required before the seed method of propagation becomes an important adjunct to other methods.

The preferred propagation method is from root stock, leaf or pitcher and petiole. Thick roots and rhizomes which are cut from an old plant into two-inch long pieces are allowed to remain in air until the cut ends seal themselves or a suitable wood sealer is applied. They are laid horizontally on top of a pot containing a peat moss-sand mixture or a sphagnum moss-perlite mix as described above. Cover the roots lightly about 1/4 inch deep with more peat and keep the whole pot evenly moist. At this stage, it is easy to keep even moisture by covering the pot with a plastic bag and placing it in light shade until growth is seen poking through the light soil covering. This usually takes 2-3 weeks for the first signs of growth and continuous growth from dormant buds seems to continue over a long time span until one thick two-inch root can give rise to five to ten individual rosettes. These tiny rosettes grow very rapidly to maturity and it remains the fastest method of propagating Cephalotus today.

To propagate from a flat leaf, one must carefully pull it off from its attachment to the rhizome. The next period is critical because first a tiny corm forms on the cut end of the leaf before it differentiates into root and leaf. After cutting, the cut end may be dipped in Rootone powder and laid flat on top of a pot of moistened perlite and covered with a plastic bag. During this time period, the corm is beginning to form and it is important during this time to prevent any mold or fungal infections from killing the young plant. So I spray the entire surface with Benlate solution before covering with the bag. After a tiny root forms, I transfer the plantlet to a pot of live sphagnum moss to allow further development in stronger light. Growing a large plant by this method is slow and it takes several years before it attains a respectable size. One can also propagate from the petiole which is attached to the pitcher the same way as described for the flat leaf.

I should mention here that I have observed a third type of leaf which looks like a large flat leaf that has curled and sealed itself at the edges to form a cone-shaped pitcher whose top edges are sometimes smooth and sometimes deeply cut. It seems to occur more often in the spring and seems to be a fairly rare type although I've seen it occur a half-dozen times already. It must be some monstrous form since no two seem alike.

No varieties or forms of Cephalotus are officially recognized, but several growers have seen real differences in different clones of the plant regarding the size of the

corrugations of the pitcher lip, pitcher shape and lid markings and shape. As was pointed out in previous CPN articles regarding Dionaea, narrow endemism does not seem to prevent marked individual variations in the plants and the same might be true for Cephalotus. Only further cultivation and time will tell.

A CP COURSE IN MICHIGAN
by Larry Halcomb

A course on CP was recently held at the University of Michigan's Botanical Gardens. The class, very ably taught by Larry Mellichamp assisted by his wife Audrey, lasted two days, September 27 and 28, 1975.

The first day, Saturday, consisted of a lecture and open discussion on a brief history, kinds, trapping mechanisms and culture of CP. Everyone discussed and benefitted from sharing cultural information. Displays of books and plants along with microscope setups were scattered around the room in which the class was held. There was a slide show showing Don Schnell's and Fred Case's plants and greenhouses and many excellent pictures of CP in their natural habitat taken by Larry Mellichamp.

The second day, Sunday, started with a lecture on planting seeds, repotting plants, taking cuttings, etc. Then, in a greenhouse, these things were demonstrated and students were given actual plants to work with and keep. Among plants received were several Drosera filiformis, several Drosera binata var. multifida, Dionaea muscipula, Cephalotus follicularis(!!), several Utricularia species; seedlings of Sarracenia flava and Darlingtonia californica; seeds of Drosera filiformis, Drosera rotundifolia, Sarracenia oreophila, Sarracenia leucophylla, Sarracenia flava, Sarracenia purpurea; cuttings of Drosera filiformis, Drosera binata, and Drosera binata var. multifida.

To top it off, the group traveled to Mud Lake Bog about ten miles northwest of the Gardens where D. rotundifolia and S. purpurea grow abundantly in the wild. As eight weary, muddy students washed themselves off, not a complaint was heard. Everyone thought it well worth it.

HEALING (AND POISONING) WITH DROSERA
by Susan Verhoek-Williams

From ancient times to today plants have supplied either the major or the most important part of many medicines. In days when diseases and cures were linked with sorcery and philosophy, a plant as novel as Drosera was sure to be employed in medicine. Surely a plant which retained drops of dew even in the midday heat must have special powers, if not a special understanding with the Sun!

The alchemists of old, in their dual search for the universal remedy for disease and for the Philosopher's Stone which would turn "base" metals into gold, held sundews in high esteem. For medieval alchemists the Philosopher's Stone with its health-giving powers became not so much an actual object but rather the spirit of the world which caused all matter to be transmuted through various stages to the highest state, gold. The closest earthly substance to spirit is air, and therefore materials which had been in close contact with air were thought to contain some of the essence of the Stone. Hence, snow, rain and dew were considered to be part of the universal Elixir of Life. Dew was believed able to dissolve gold. Because it apparently was more "in tune" with the sun, the "dew" on a sundew was considered the most powerful.

In France, sorcerers (as alchemists were popularly known) used Drosera in their potions. Laymen ascribed to it both harmful and beneficial effects. A single plant brought into the house was thought to cause pernicious fever. Outdoors, however, one who searched for a sundew and rubbed its leaves over his skin on St. John's Eve would become indefatigable. Searching was necessary; a person who simply blundered upon the plants would be confounded and never find the spot again.

It was easy to tell if Droseras were nearby, at least so it was believed in the Bourbon region of France. There, it was said, the plants glowed at night and by day green woodpeckers marked the spot; they could be seen flying strangely as they maneuvered to pluck the sundews, which were used to harden their beaks.

Sorcerers and laymen alike collected the plant on St. John's Eve (Midsummer Eve), midnight being considered the time to gather the most effective plants. The gathering was perilous; the collector had to do his collecting walking backwards to avoid being followed by the devil. Devil or no, walking backwards in a bog at midnight would give a collector an uneasy feeling.

Men and women interested in more earthbound things than sorcery probably also experimented with sundews in their quest for cures. Sensitive people who handled the leaves may have

noticed reddening and blistering on their hands. Perhaps a wart disappeared at the same time. Fresh, mashed Drosera leaves or an alcoholic extract of the leaves has been used in Germany, Indochina, and America to cure warts and corns. And if it was good for warts and corns, why not bunions and freckles? It has been used against both of those conditions, and sunburn also.

The sunburn treatment is of the type practiced in homeopathic medicine. This philosophy of medicine holds that in order to cure a disease it must be treated with a medicine which produces the same symptoms in a healthy person. Therefore, since tincture of Drosera causes reddening and blistering of normal skin, homeopathy would use small doses of it to cure skin which was reddened and blistered by the sun.

How Drosera came to be used internally is more difficult to explain. Perhaps it was a simple matter of trying any plants and selecting those which worked, or seemed to. Or perhaps it was the homeopathic philosophy that discovered the medicinal effects. Sheep occasionally became ill with terrible fits of coughing which were eventually fatal. The poisoning was thought to be the result of eating sundew plants. So again, fighting symptom with symptom, sundew extracts and teas were prescribed for coughing diseases in humans--tuberculosis, asthma, catarrh of the lower respiratory tract, and whooping cough. Reports of this use are prevalent in German and French medicinal plant books even as recently as the late 1960's. Pharmaceutical preparations have been sold under the names *Herba Droserae*, *Herbe Rorellae*, *Herba Roris solis* and, in Italy, *rossoli*. Drosera was mentioned in the French pharmacopoeia as late as 1965.

Herba Rorellae was a favorite whooping cough remedy because of its practical value--it worked. But no one knew why. Before scientific investigation of sundew extracts were made, it was thought that the medication had an antibiotic action against whooping cough bacteria. This turned out not to be true. Instead, the action of the medicine was discovered to be antispasmodic. Several studies made between 1933 and 1956 identified the active ingredients in Drosera tinctures as compounds of the class called naphthoquinones. All Drosera species tested so far contain one or more naphthoquinones, the two most common being 7-methyljuglone and plumbagin. Drosera longifolia, D. intermedia, D. rotundifolia, and D. anglica contain plumbagin. Drosera intermedia and D. anglica contain 7-methyljuglone. (For the distribution of these quinones in other species, see the paper by Zenk, Fürbringer and Steglich.)

In Madagascar, D. ramentacea is used medicinally for cough. These plants contain ramentaceone, 7-methyljuglone, and plumbagin. According to Luckner and Luckner, *Herba Droserae* is no longer being obtained from D. rotundifolia but from D. ramentacea.

Scientists, most recently Bezanger-Beauquesne in 1955 and Krah1 in 1956, have treated pieces of guinea pig and rabbit intestine with extracts of Drosera and found that muscle spasms in the intestine walls are initially strong but gradually reduce in both amplitude and frequency. Krah1 found that a naphthoquinone from D. rotundifolia also suppressed cough caused by electrical stimulation of the laryngeal nerve. Even more recently, Ramanamanjary and Boiteau found that subcutaneous injection of an alcohol extract of D. ramentacea protected guinea pigs from bronchial spasms artificially induced by histamine and acetylcholine.

Herba Rorellae is prepared by first gathering the rosettes at flowering time. The folk healers already had stumbled onto the fact that a greater amount of active ingredient was present at the time of flowering; St. John's Eve, June 23, which is specified as the collecting date in many accounts of medicinal and magical plants, falls early in the flowering season. After the rosettes, without the roots, are gathered, they are air dried. Drying reduces the plant volume by as much as 90%. It is this extreme reduction in size as well as the relative scarcity of the plants that causes the high price of the drug. As a home remedy, the fresh or dried leaves are infused in water to make a tea. To obtain the tincture used pharmacologically, 200 grams of the dried plants are macerated in 1000 grams of alcohol for ten days and the solution filtered. Tinctures of Drosera are sold in approximately this form. To isolate pure plumbagin or methyljuglone requires about six extraction and distillation steps.

A number of workers have found that the amount of naphthoquinone in commercial tinctures varies widely. Sometimes this may be due to the varying amounts of chemicals in the plants themselves. In addition, even tinctures rich in naphthoquinones lose potency after a time on the shelf.

When used externally, the leaves are used fresh, mashed, and applied either alone or with salt when a blistering or reddening agent (rubefacient) is required. External uses have been reported from Germany, Indochina, Nepal, and the United States.

Various recipes for taking *Herba Droserae* internally are given. As a tea, Fischer records

a single dose of 1/2 gram of sundew with honey or brown sugar added. For pharmaceutical preparations in France, Garnier and colleagues describe the usual doses as 0.5 to 2 grams per dose, or 3 to 10 grams per 24 hours. A complex medication is made of Drosera extract, Syrup of Poppy, Syrup of Orange Flower, and sugar syrup, to be taken by the spoonful. For infants, 2 grams of Tincture of Drosera and 200 grams of Sirop de Coquelicot (Syrup of Poppy) can be mixed. For the elderly, Drosera is also part of an infusion prescribed for cases of arteriosclerosis. This tea contains hawthorn leaves, buckthorn bark, licorice root and strawberry.

Drosera-based cough medicines have progressed from folk medicine to clinical use and finally to validation by scientific studies that isolated the active ingredient. Such folk medicines which were successful against one condition were often tried against other diseases as well. In the case of sundew, treatments have been used for a variety of abnormal conditions in addition to coughs, arteriosclerosis, and skin problems. Perhaps one day these remedies will be tested for efficacy: The French have used it for stomach maladies. Homeopathic medicine has prescribed the drug for eye and ear inflammation, tic douloureux, and rheumatic joint pain. In Germany Herba Rorellae prepared from D. rotundifolia has been sold to relieve morning sickness, liver pain, and dropsy. It has been used as a tranquilizer and a diuretic and has been accorded aphrodisiac properties (as have been the majority of medicinal plants, including D. filiformis and D. longiflora). Many of these European cures have also been employed in the United States. In India, D. peltata is used as an antisyphilitic and blistering agent. Drosera is included among the medicinal plants of Brazil and in Mexico the Chinantec Indians use a species of the subgenus Rorella to treat toothache and intestinal troubles.

On the reverse of these healthful and reputedly healthful effects are some very detrimental ones. Clinical treatment with Drosera is specifically contraindicated in cases of high blood pressure. Another study has shown that intramuscular injection of the extract results in digestion and death of muscles and blood vessels.

As a general rule it is never wise to resort to a home-prepared plant remedy. Self-diagnosis can lead to improper and potentially dangerous treatment. Pharmaceutical preparations of Herba Droserae have been shown to contain varying amounts of naphthoquinone. Home-concocted remedies can contain even less standard doses. Overdoses of Drosera extracts, probably because of extreme amounts of naphthoquinones, cause irritation of the skin and mucous membranes, intestinal irritation, severe cough, and bloody diarrhea. According to Jacobs and Burlage's compendium, D. rotundifolia causes the pleural surface of both lungs to become studded with tubercles, "produces shuddering in man, a sense of constriction of the chest, rawness in the throat, pains in the bowels, diarrhea, sweat and diminished secretion of the urine." Were this not enough, D. rotundifolia and D. peltata are reported to produce cyanide.

So, having read this, if you don't walk backwards when collecting Drosera--at least don't chew the plants.

Medicinal Uses of Drosera Species

Species	Antispasmodic for cough	Corns & warts	Rubefacient	Other (See Text)	Country of use
<u>D. burnanni</u>			X		India
<u>D. filiformis</u>	X		X	X	US
<u>D. indica</u>		X			Indochina
<u>D. intermedia</u>	X				France
<u>D. longiflora</u>	X	X	X	X	France US
<u>D. peltata</u>			X		India
			X	X	Nepal
<u>D. ramentacea</u>	X		X		Madagascar
<u>D. rotundifolia</u>	X	X	X	X	France Germany US
<u>Drosera</u> spp.				X	Mexico
		(unspecified)			Brazil

Selected Bibliography

- Altschul, S. vR. 1973. Drugs and foods from little known plants. Cambridge, Mass.: Harvard University Press.
- Bezanger-Beauquesne, L. and M. J. Vanlerenberghe. 1955. Contribution a l'etude du Drosera. Ann. pharm. franc. 13:204-207.
- Boros, E. 1963. Unsere Heil- und teeplanzen. Stuttgart: Verlag Eugen Ulmer.
- Chopra, R.N., S. L. Nayar, and I. C. Chopra. 1956. Glossary of Indian medicinal plants. New Delhi: Council of Scientific and Industrial Research.
- Duquenois, P. 1957. Apropos du Drosera de Madagascar, Drosera ramentacea Burchell. Ann. pharm. franc. 15:599-601.
- Fisher, G. 1966. Heilkrauter und Arzneipflanzen. Ulm/Donau: Karl F. Haug Verlag.
- Garnier, G., L. Bézanger-Beauquesne, and G. Debraux. 1961. Ressources medicinales de la flore Francaise. Paris: Vigot Frères.
- Gessner, O. 1953. Die Gift- und Arzneipflanzen von mitteleuropa. Heidelberg: Carl Winter Universitäts Verlag.
- Hoehne, F. C. 1939. Plantas e substâncias vegetais toxicas e medicinais. Sao Paulo: Graphicans.
- Hurst, E. 1942. The poison plants of New South Wales. Sydney: New South Wales Poison Plants Committee.
- Jacobs, M. L. and H. M. Burlage. 1958. Index of plants of North Carolina with reputed medicinal uses. Henry M. Burlage.
- Krahl, R. 1956. A pharmacologically active substance isolated from Drosera rotundifolia. Arzneimittelforsch. 6:342-348. (Chem. abstr. 15760f).
- Lanessan, J.-L. de. 1885. Manuel d'histoire naturelle médicale. Paris: Octave Doin.
- Lieutaghi, P. 1966. Le livre des bonnes herbes. Robert Morel Éditeur. (Includes an account of French superstitions concerning Drosera).
- Luckner, R. and M. Luckner. 1970. Naphthoquinone derivatives from D. ramentacea. Pharmazie 25:261-265. (Chem Abstr. 73:123469z).
- Mercer, J. E. 1921. Alchemy: Its science and romance. London: Society for Promoting Christian Knowledge.
- Nepalese Department of Medicinal Plants. 1970. Medicinal plants of Nepal. Kathmandu: Ministry of Forests, Department of Medicinal Plants.
- Ramanamjary, W. and P. Boiteau. 1968. Protective activity of Drosera ramentacea against bronchospasm. C. R. Acad. Sci., Paris, Ser. D. 266:1787-1789. (Chem. Abstr. 69:17858h).
- Zenk, M. H., M. Fürbringer, and W. Steglich. 1969. Occurrence and distribution of 7-methyljuglone and plumbagin in the Droseraceae. Phytochemistry 8:2199-2200.

THE DROSERA BINATA COMPLEX

by J. A. Mazrimas

We get frequent requests to differentiate between the variants of the Drosera binata complex which all grow in Australia along the eastern seaboard. It is interesting that the variants are self-sterile but interfertility is good when variants are crossed with one another. A description follows on how to differentiate between the various types.

The "T" form is the simple one with the petiole dividing into two leaves which grow in this way for years. I've never seen its leaves divide any further. Its petiole is of uniform width throughout.

The var. dichotoma is more complex in that the leaf portion divides either one or two more times to produce a maximum of eight points. The leaf is somewhat wider than the petiole (about three times) and frequently the width is non-uniform at the base of the branch point; that is, the leaf branches unequally so that one portion of the leaf is noticeably wider than the other.

Finally, we come to the var. multifida whose leaves exhibit many branchings up to 27 points as described in CPN 4,48,1975. The leaves divide evenly so that they have a uniform width throughout. The tentacles seem to exhibit more red color than var. dichotoma in the strongest light. The leaves have nearly the same width as the petiole which supports the branched structure.

The flower color is usually white on all three variants. However, a rare pink flower form is known to occur with var. dichotoma and var. multifida.

All three variants make very good basket plants since the petioles grow long and seem to flop over the pot. I hang my pots of these plants by wire to a pipe attached to the roof of the greenhouse. The plants relish the extra light and the beautiful leaves grow thickly over the pot showing off their dewy tentacles in the morning light. I use an inexpensive plastic pail to pot the plants and fill the bottom half with pure perlite and fill the rest with sphagnum moss and perlite mix. I water to fill pail up to the level of the perlite layer.

SPECIAL NOTICES

CPN BACK ISSUES AVAILABLE--Early last spring, one of our subscribers undertook as his own project (with our permission, but the co-editors receive no money from this at our own request) reprinting of past issues of CPN. He still has a few left which he will sell to new subscribers while the supply lasts. After this, he will no longer offer the offprints since printing expenses have risen so much. He still has available complete sets of Vol. 1, 2, 3, and issue No. 1 of Volume 4 (total of 13 past issues) covering the years 1972-74 and early 1975. Prices are postpaid surface: US, Canada, Mexico--\$2.00 per single issue, \$6.00 per volume (four issues). Overseas--\$2.25 per issue, \$7.00 per volume. Send all orders with payment in full to A. ROGER KIRBY, Route 3, Box 470, Granite Falls, NC 28603. DO NOT send orders to the co-editors. If the volume(s) you order are sold out when your order is received, your check will be promptly returned.

Bob Hanrahan mentioned that he has a method to produce deionized water for pennies a gallon using ordinary tap water as a source. If you are interested in producing five, fifteen, or twenty-five gallons of high quality water daily suitable for growing CP and other salt sensitive plants, then contact him for a catalogue and enclose 25 cents: Agro Products, P. O. Box 427, Bellflower, CA 90706.

RECENT LITERATURE

De Bruyn, A.: Insectivorous plants. Veld & Flora 61(1): 21-22. 1975.

Another popular article written in African and sent to us by Carl E. Forst who roughly translated it. It simply describes the various types of CP and their functions in respect to the type of trap, coloration and digestive enzymes.

DeBuhr, L.E.: Two new species of Drosera from Western Australia. Aliso 8:263-271. 1975.

D. marchantii and D. fimbriata, two tuberous species, are here described for the first time. D. marchantii--interestingly for a tuberous species--is found most commonly in very wet humus soils and more rarely in drier, better drained laterite soils. D. fimbriata is so named for the non-carnivorous fimbriate leaflike petioles which it produces in addition to typical carnivorous leaves.

Selkow, Paula: Carnivorous Plants. Free Enterprise 5(6):98-101. 1975.

A popular article describing the various ways that carnivorous plants are exploited for business and profit. Different methods are described to sell these rare plants at tremendous profit to the entrepreneur. As these plants become more popular, it is hoped that all available plants originate from propagated stock and not the fragile and dwindling bogs. The Smithsonian List was mentioned, but not the likely outcome that CP selling will soon be sharply curtailed.

Sydenham, P.H., Findlay, G.P.: Transport of solutes and water by resetting bladders of Utricularia. Aust. J. Plant Physiol. 2(3): 335-352. 1975.

The bladder of Utricularia after stimulation and increase in volume, slowly resets, transporting solutes, mainly Na^+ , K^+ , Cl^- and water from the lumen to the outside. This resetting process requires energy which is provided by respiration and not photosynthesis. Transport is mainly through the mouth region of the bladder.

Tim, S. K-M: Insectivorous plants indoors. Terrariums (Brooklyn Botanic Garden Record) 31: 34-39. 1975.

An article describing terrarium culture of CP, with some brief descriptions of major genera, and with drawings and photos.

Williams, Stephen E.: The comparative sensory physiology of the Droseraceae--the evolution of a plant sensory system. Talk given on November 14, 1975 at the American Philosophical Society, Philadelphia, Penn.

This talk discusses the sensory physiology of Aldrovanda, Drosera and Dionaea and compares the three genera in terms of its evolutionary development.

We are offering an update of the annual list of carnivorous plant commercial sources. It is our experience that spring is the best season to order these plants. We do not endorse any of these sources. Those sources who have volunteered a letter stating that all stock is propagated rather than scavenged from the field, are listed first and marked (*).

<u>Name and Address</u>	<u>Catalogue</u>	<u>Genera</u>
SUN DEW ENVIRONMENTS * P. O. Box 503 Kenmore Station Boston, MA 02215	Self-addressed stamped envelope	Dionaea, Drosera, Sarracenia, Pinguicula, Darlingtonia, Utricularia
WORLD INSECTIVOROUS PLANTS * P. O. Box 427 9447 E. Artesia Boulevard Bellflower, CA 90706	Self-addressed stamped envelope or 25¢	Dionaea, Drosera, Utricularia, Byblis liniflora
Peter Pauls Nurseries Darcey Road Canandaigua, NY 14424	25¢	Dionaea, Drosera, Sarracenia, Pinguicula, Darlingtonia, Utricularia, Nepenthes seed
Armstrong Associates, Inc. Box 94 Kennebunk, ME 04043	25¢	Dionaea, Drosera, Sarracenia, Pinguicula, Darlingtonia
Arthur E. Allgrove North Wilmington, MA 01887	25¢	Dionaea, Sarracenia, Pinguicula, Drosera, Darlingtonia
Insectivorous Botanical Garden P. O. Box 1435 Wilmington, NC 28401	25¢	Dionaea, Drosera, Sarracenia, Darlingtonia, Pinguicula
Edelweiss Gardens 54 Robbinsville-Allentown Road Robbinsville, NJ 08691	35¢	Dionaea, Drosera, Sarracenia, Darlingtonia, Nepenthes
Tote Em in Zoo Route 2, Box 368 Wilmington, NC 28401	25¢	Drosera, Sarracenia, Pinguicula (Sells in <u>large quantities only</u>)
Marcel Lecoufle 5 Rue de Paris 94470 Boissy-Saint-Leger, France	Inquire	Drosera, Dionaea, Sarracenia, Nepenthes, Darlingtonia, Pinguicula
Harold Welsh Black Copper Kits 266 Kipp Street Hackensack, NJ 07601	25¢	Dionaea, Drosera, Sarracenia, Darlingtonia

A FEW REFERENCE BOOKS (Not available through CPN. Order direct from publisher or your local bookshop.)

<u>Title</u>	<u>Author</u>	<u>Publisher</u>	<u>Source - Cost</u>
Insectivorous Plants	Charles Darwin	?	?
Plants of Prey in Australia	Rica Erickson	Univ. of W. A. Press 1968	Inter. Scholarly Book Ser. P. O. Box 4347 Portland, OR 97208 \$9.65 postpaid
Carnivorous Plants	F. E. Lloyd	Chronica Botanica 1942	Second hand bookstores (out of print)(libraries)
Carnivorous Plants	Randall Schwartz	Praeger Publishers 1974	111 4th Ave, New York, NY 10003 \$6.95
Carnivorous Plants	Randall Schwartz	Avon Books (soft cover) 1975	959 Eighth Avenue, New York, NY 10019 \$1.25
Carnivorous Plants	Anabel Dean	Lerner Publications 1975	241 First Avenue Minneapolis, MN 55401 \$3.95

The World of Carnivorous Plants	J. and P. Pietropaolo	R. J. Stoneridge 1974	Peter Pauls Nurseries \$6.30
Insect-Eating Plants*	L. and G. Poole	T. Y. Crowell 1963	666 Fifth Avenue New York, NY 10003 \$4.50
Carnivorous Plants*	John F. Waters	Franklin Watts, Inc. 1974	845 Third Avenue, New York, NY 10022 \$3.90
Plants That Eat Animals*	Linna Bentley	McGraw-Hill Book Company 1968	1221 Ave. of Americas New York, NY 10036 \$4.72

* Children's books

THE CPN SHOP

Once again, we are providing CPN members with the opportunity to order CP books published in Japan. They are written in Japanese, but many of them are generously interspersed with excellent pictures both in color and black and white of many CP species, some titled in their Latin names. Several of these books that we offered in the past are now sold out and are out of print. So, while the limited supply lasts, we offer the following books at prices that include all postage (overseas and domestic). Please send your check or money order to J. Mazrimas before May 1, 1976. Expect a delay of two or three months before you receive the book you ordered.

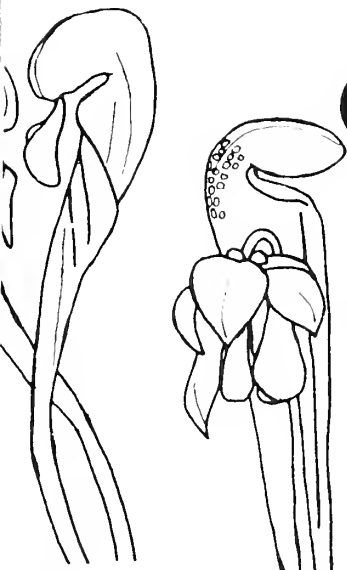
<u>Author</u>	<u>Title</u>	<u>Pages</u>	<u>Price</u>
Shimizu	The Mystery of Carnivorous Plants	54	\$3.25
Suzuki	Insectivorous Plants (Cult. and Coll.)	168	\$2.25
-----	Aldrovanda vesiculosa at Hanyu-City	32	\$2.75
Kondo	Carnivorous Plants	292	\$7.25
Komiya	Syst. Studies on Lentibulariaceae (Eng.)	124	\$9.00

OTHER ITEMS FOR SALE

WORLD LIST OF CARNIVOROUS PLANTS - An updated list of all species with synonymy and native areas mentioned. While based broadly in Index Kewensis, many references and experts were consulted during the task of preparing this worldwide listing.
---60¢ postpaid surface, \$1.20 air overseas

KEY TO NORTH AMERICAN UTRICULARIAS by Katsu Kondo - This is the first modern key of this complex genus that can be used objectively and deals in above ground or above water characteristics, mainly flower characters. All other keys suffer from incompleteness, gross errors and dependence on rather subjective determinations. Illustrated, and with additional commentary by Peter Taylor.
---60¢ postpaid surface, \$1.20 air overseas

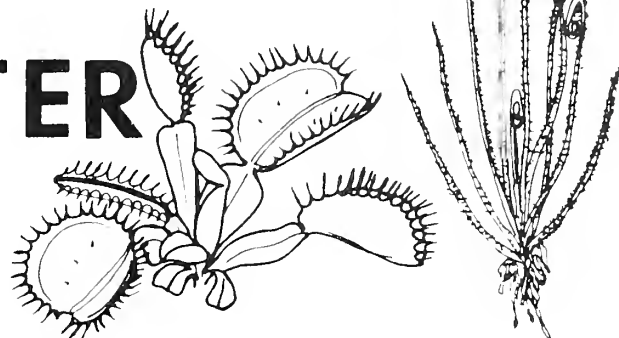
Since we are out of back issues, we thought these selected offprints would be especially useful to new subscribers. Cost pays printing and mailing expenses only. To order any of the above, send payment to J. A. Mazrimas, 329 Helen Way, Livermore, CA 94550.



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EDITORS: D. E. Schnell, Rt. 4, Box 275B, Statesville, NC 28677 USA
J. A. Mazrimas, 329 Helen Way, Livermore, CA 94550 USA

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DIONAEA MUSCIPULA

One of several plants of *Dionaea muscipula* grown in the greenhouse at the Huntington Botanical Gardens which produced scapes with a proliferation of plantlets in the terminal portion. Plantlets developed on the inflorescence after flowering, eventually bending scape over below the soil line of the mother plant.

(Photo and caption courtesy of Fredrick Boutin, Botanist at Huntington Botanical Gardens, San Marino, California)

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NEWS AND VIEWS

STEVE ROSE writes: "When Cephalotus root cuttings are available and a large quantity of plants are wanted, it is better to lay the roots horizontally on the soil, and if single or two bigger plants are wanted, then plant them vertically. The roots are large (up to 1/2 inch (12 mm.) in diameter but mostly about 1/4 inch (6 mm.) and most are uncut from mature flowering plants of full size having three or more shoots at the surface. The leaves and pitchers are cut off to prevent foliage rot into the stem. These cuttings were kept in water for 4-5 weeks with no loss. They are just starting to shoot new rhizomes. The rhizomes stay white the first year and gradually darken with age and eventually thicken to form the fat rootstock. Better plants and larger ones seem to come from old rootstocks than young ones which tend to rot more easily. The fat dark roots should not be placed more than 1 inch (25 mm.) below the surface of peat moss. Standing the pot in water seems to slow down shooting, so it is best to keep it out of water and drier than established plants. Once a plant grown from a mother root is developed with several pitchers, it can be removed with moss intact. The mother root then can be used again for more propagation. The young plant can survive if placed in a humid container and not given much sunlight at all. The best plants in the wild that are the biggest and healthiest are always partially shaded and have mediocre color shades. Those that grow in full sun (very rare) are always runts and the pitchers tend to shrivel too soon and are not luxuriant. Another rather involved way to increase numbers of plants and maturing good roots is this. Take a deep pot and place a good large root half-way down the pot and cover with one inch (25 mm.) of peat moss and allow it to develop leaves only by cutting off pitchers and keeping in deep shade. After about six weeks to eight weeks, cut the growing head and allow the wound to form a callus. Then leave the plant to develop more shoots and cover straightaway with one inch of peat moss. This must be done BEFORE the rhizome point develops into leaves and pitchers. Press the moss firm but not hard around the plant each time. Be careful with watering to lessen chances of rot. Use deionized water. This method mimics what happens in the bush. There is no reason why it can't be done three to four times in one growing season. The level of one inch is fairly near enough to the moss and leaf mold cover where Cephalotus grows naturally. Any deeper may inhibit growth too much by exhausting the mother root. It is important that the cut should not be made too low since new shoots should come from the side buds which are located just below the growth of leaves."

JERRY BALDINO found a unique way of germinating Darlingtonia seed. He sows the seed into the pores of a sponge, wets the sponge with a benomyl solution (systemic fungicide) and places it into a large jar. After screwing on the lid, it is placed in an area where there is good light and in two to three weeks the seeds begin to sprout.

ADRIAN SLACK writes from England: "I agree with your sentiments on Nepenthes, and I would also like to see them regain their popularity. It would be difficult to put one's finger on the exact reason why they lost it, but it may have been connected with the rise and decline of the great Stove Houses of this country. About the middle of the last century, live plants and seeds of exotic plants from the tropics started to stream as never before into the land, and these were avidly collected by the landed rich, who had sufficient leisure to cultivate an enthusiastic and intelligent interest in them, though I doubt whether they did much gardening themselves! This was the era of the great head-gardeners who often had forty or more gardeners under them on the big estates. For men who had often risen from the position of garden-boy they were a surprisingly learned and skillful lot, as their letters and articles to the Gardeners Chronicle of the latter part of the last century testify. There were very few new introductions in the plant world which could not be grown under their direction, and it is again clear from the G.C. of that time that Nepenthes was much grown during the seventies, eighties, and nineties, when references and articles about them appear. I imagine that they would have been grown almost exclusively by these professional gardeners, and that they would have been looked upon by amateurs as "difficult plants" best left to those with the right facilities and skilled staff to grow them, for I don't think the more sophisticated amateur of today was much in existence then, and towards the end of the century amateurs would have been mainly followers of the natural landscape school of William Robinson. About the end of the century there seems to have been a marked reduction in interest in the Stove House for its own sake--the "tropical garden" and "tropical bedding" had now become very popular in which such tropicals and sub-tropicals as would grow were planted outside for the duration of the summer, and this was probably largely the cause, though I think a contributory factor may well have been the financial collapse of the firm of Veitch of Chelsea which had done so much to popularise these and other exotics of which they

imported and grew large quantities. This would have reduced the range of tropical plants still being grown, and I think that plants that could be put under the heading of "botanical curiosities"--so unfortunate in the case of the splendid Nepenthes-- would have been the main sufferers. Even though one hears so little of them between 1900 and 1914, I assume they must have persisted in a number of gardens, but rigorous fuel rationing in that war brought death to the occupants of most if not all the great private stove and palm houses in this country, and the changed economic conditions that followed made the great stove houses things of the past, staffs being much smaller, and heating bills an important consideration. After the 1939 war, those who had once employed twenty gardeners were fortunate if they could employ two, and so we have come to the age of the amateur in which privately employed gardeners are a rarity and highly skilled ones almost non-existent since they can get better jobs elsewhere. However, the result of this is that we find ourselves capable of growing more and more things without much difficulty that formerly we would have thought fairly impossible except for the professional, and we often adopt new methods to meet the changed conditions to economise on labour. I have no doubt at all that Nepenthes will more than retrieve its former popularity here, and I certainly intend to do what I can to encourage this to happen."

TERRY BROKENBRO writes about a "Round Robin" letter exchange that he would like to start. He would like anyone interested to write to him and to note what type of CP they are interested in. The rules: "(1) All CPN subscribers are eligible. (2) I would require details of participants' particular interests (e.g. Nepenthes, Drosera, Pinguicula or CP in general). Even if there was particular interest in one species (e.g. D. spathulata), this should be mentioned so that if demand is great enough, a R.R. could be started just for this. (3) Each 'Robin' would consist of approximately 8-15 participants, although more than one Robin can be set up for any subject. (4) R.R. participants should realize that in fairness to others, they should not join when there is a possibility of having to cease correspondence after a few months due to personal circumstances. (5) Upon receiving correspondence, this should be passed to the next participant as soon as possible in order to have uninterrupted flow. Participants may not always have any comments or information to add, so it should be passed without delay to the next person on the list." Those who are interested should write to Terry since the best of the information will find its way into CPN. His address is: Mr. Terry Brokenbro, 37 Laburnham Gardens, Upminster, Essex, RM14 1HX, Great Britain.

GEORGE ASHLEY just returned from his Christmas vacation to New Zealand where he tried to get to Mt. Arthur and its pass but it was still under much snow and blocked by a landslide. The wet and frosty weather was no help, so he turned back and visited some sphagnum moss swamps, but he did not find any CP there. "I managed to find the glass houses in Auckland Domain but I got there just as the attendant was closing up for the day. However, I did manage to see seven large hanging baskets about 18 inches in diameter containing several good specimens of Nepenthes khasiana and a Nepenthes khasiana hybrid. The attendant informed me that they were growing other carnivorous plants but they were not yet on public display. We returned via Sydney, Australia and called in at the Botanical Gardens where they have several glass-houses. These were not open to the public and were painted with white paint. I managed to get around the back where there was some clear glass and saw some magnificent Nepenthes. These were hanging up and the stems or vines were up to 7-8 feet long covered with many large and various-sized pitchers. One had a large creamy-colored pitcher with large purple spots--a real beauty!"

HENRY DEMMINK writes: "I believe that seed of Nepenthes would always be best to import as this does not involve the ripping up of plants, customs, etc. I believe that seed lines acclimate better than cuttings and your chances are multiplied by having many young plants rather than a couple of beat-up cuttings. Sphagnum is really the best medium. The biggest problem is water. Overwatering for any extended period, especially in winter, leads to a soggy mess and sure death to the plants. On the other hand, once dry, even for a short period especially in summer, also sets them off on the street of no return. The best advice I have ever read on Nepenthes plants was in Greenhouse and Stove Plants by Thomas Baines, London, 1894. It would be well worth reading and quoting in CPN."

JOE MAZRIMAS writes: "Add to your World CP listing the following new species recently named: Drosera fimbriata, DeBuhr - Western Australia Drosera marchantii, DeBuhr - Western Australia Utricularia asplundii, Taylor - Columbia, S.A.

I get many questions on how terrestrial species of Utricularia can grow in soil and still are able to capture organisms in their bladders. Most of these plants grow in very wet soil and they must always have free water just below the surface. They usually grow a short distance away from a lake or pond shoreline. So, there are plenty of micro-organisms living in this semi-wet soil which are easily captured by the bladders. Sometime when you have the occasion to walk along such a shoreline, poke around the surface layers and take a small sample in a bottle. After the soil has settled, you may see swimming in the water several types of organisms. You might have to use a microscope to see the tiny organisms. It is interesting to note that production of flowers by the terrestrial types is dependent on the water level and it is at a critical depth where production of flowers takes place. Usually, a low level of water will lead to flower production."

JOE MAZRIMAS continues: "Many people germinate seed of Darlingtonia and Sarracenia at the same time, same temperature and similar soil and light conditions. This is fine for awhile but after about 6-8 months, they notice that they are losing plants of Darlingtonia while the Sarracenia seedlings go on growing with small losses. The reason for this is the fact that Darlingtonia has a maximum temperature requirement above which the roots become non-functional and die off. This temperature is about 65°F. (18°C.). In mature plants of Darlingtonia, when the temperature of the roots exceeds 65°F., they die, but the pitchers show no immediate or obvious symptoms until some time has passed. This time period depends on the level of humidity--the higher it is, the longer the pitchers remain green. Soon, if temperatures remain high, new roots cannot grow and the plant eventually dies, the whole plant turning brown. The message here is that after six months of age, Darlingtonia should be grown with the root level below 65°F. and preferably at 55°F. so that minimal losses are sustained during the course of growing this beautiful plant. If the temperature should exceed this level for a day or so, then immediately try to lower it so that new roots can grow and thrive. A plastic bag over the pitchers may be necessary during this new rooting process.

"Various people have written me on the subject of soils for CP. Many of them have purchased prepared soil mixes meant for African violets and other house plants. They found that these mixes are very satisfactory for growing various genera of CP as long as they remain continuously moist. We would like to know the experiences of other CPN subscribers on this subject, especially those who have used these methods for a long time."

STEVE ROSE has some comments on Byblis: "On the question of pollinators of Byblis, I have seen excess pollen on the petals of Byblis at 11 A.M. on a dry, windy day in mid-summer. The plants received continual movement from the wind and pollen was being released by this movement. There were no apparent pollinators. Maybe there are none. The pollinating method is similar to tomatoes--they use the movement of wind, etc. to pollinate and will not pollinate under still air conditions as in a non-ventilated hothouse and with no insects present. Pollination occurs either by insect or movement of flowers as "flicking" by the fingers. This I know by experience. Byblis are true perennials--the rootstock surviving and sometimes a seedling or root shoot continuing to grow from the one growth tip until flowering occurs which could be several seasons. After flowering, the plants recede even if the non-flowering ones do not. I have seen plants with two seasons' old growth and one new season's--the others may have completely rotted. Plants can also emerge from root remnants left after digging out the older plants. These emerged the following season. The roots go down more than two feet into sandy soil and they are apparently naturally adventitious."

Australian Plants 8, 172 (1976) lists references to previous issues which described carnivorous plants and illustrated them in color. The references are given below. Reprints of the volumes are available from Australian Plants.

General Listing	3, #27: 219
Nepenthes mirabilis, the Tropical Pitcher Plant	3, #27: 319
Aldrovanda vesiculosa, the Waterwheel Plant	3, #27:319 and 4, #35: 291
Byblis gigantea, B. liniflora, the Rainbow Plant	1, #8:28 1, #9:23 3, #27: 321
Drosera, Sundews	3, #27:319 4, #35: 287-291 7, #60: 355,359
Cephalotus follicularis, the W. A. Pitcher Plant	1, #8:26,28 3, #27:319 4, #29:28,34,36 8, #64:172
Polypompholyx, the Pink Petticoats	4, #35:293,324
Utricularia, the Fairy Aprons	4, #35:292

STEVE HAMMEL wrote and made several good suggestions. One concerns a pronunciation gazetteer of some sort so the newcomer into botany could speak properly. Actually, there is no official botanical pronunciation system paralleling the detailed system of naming plants. Generally, the rules do not follow Latin rules and one more or less follows a few very loose rules or the pattern of pronunciation used by most botanists. As an example: S. flava-- the first "a" in the species name should be pronounced "ah" using Latin and derivative language rules, but most botanists pronounce it "ay". But the final "a" does have a soft sound! So there we stand. If anyone has access to Radford, Dickison, Massey and Bell Vascular Plant Systematics (Harper and Row), there is a chapter on pronunciation of many Latin terms based on the common use principle. Secondly, Steve has suggested that periodic CPN sponsored forays into the field be held regionally so CPNers could meet and get acquainted. Great idea!--any organizational volunteers?

HENRY J. DEMMINK writes us to tell us about the reprints of Das Pflanzenreich. The address for the reprints: J. Cramer, Natural History Publisher and Bookseller, P. O. Box 48, 3301 Lehre, Germany. Evidently, there has been a run of orders for these reprints and there is some delay and confusion. But now supplies are adequate. See CPN 4, 42, 1975 for details on what to order. Also, Mr. Demmink picked up a book from a second hand bookstore called Men of the Jungle by Ion L. Idriess that was published in Australia, 1933. He would like to quote from a chapter where the author in company with an aboriginal "Toby" is instructing him on the local natural history: "The aboriginal's greatest delicacy is wild honey. The plant he condemned was fastened to a tree trunk. From between its apparently painted small brown-green leaves grew small vase-shaped snow-white flowers with an inviting scent. In each tiny cup lay a diamond of honeydew; and on a drooping stem hung two dainty knobs like russet-brown peas. With an expression of extreme dislike, Toby jerked off and opened one of these peas and revealed a rounded white pearl. It was really a shroud of petals holding tight the remains of a native bee. After the flower has sucked the life-blood from its prey, it slowly opens its petals and ejects the husk, to await in deathly beauty its next victim." This site was on the Bloomfield River near a place called Pierce's Landing. The Bloomfield runs from the ocean about midway between Cooktown and Cairns in Queensland. Any comments from our Australian subscribers?

Henry also tells us of an old book called Greenhouse and Stove Plants by Thomas Baines, John Murray, Pub. London 1885. In this book is described the condition for successfully growing Nepenthes, Sarracenia, Dionaea and Drosera. The author mentions several factors that are essential in growing Nepenthes. First, is heat and high humidity and the necessity of growing them in strong light to produce pitchers with full color. Secondly, Nepenthes is sensitive to any root disturbance in repotting. One cannot allow the potting material to become sour or decomposed by overwatering since this would be detrimental to their growth. Roots are very brittle and great care must be taken in dissolving away the old material under a pail of water before they are ready to be potted into fresh medium. Early spring is the time to carry this out and the pot should be no larger than 10 to 12 inches in diameter. The light should be sufficient to cause the leaves to become mottled red and this is evidence that the plant should produce pitchers at the end of every leaf. In summer the minimum temperature should be 70° F. and the plants should be watered and syringed every day. The day temperature should be 85°F. Good drainage is essential and indispensable to a healthy existence. The medium should be the best fibrous peat, potsherds, sand and chopped sphagnum.

JOE MAZIRMAS says that he is receiving several reports of Sarracenia purchased from commercial sources that are infected with worms, usually cutworms or army worms. You can detect this damage by looking for the orange colored frass which appears every morning on the surface of the soil. This looks like a small mound of orange sawdust which is the excrement of the worm as it bores through the rhizome of your Sarracenia. If immediate action is not taken, it will eventually lead to the plant's demise. An easy solution is to squirt a solution of Malathion or Diazinon into the hole you will see just under the mound of frass. Usually, this takes care of the problem effectively and a second application may be necessary only under an extreme case. (Ed. note--The larva is the Sarracenia root borer, Papaipema appasionata, not a "cutworm" or "army worm". DES)

We would like to know if subscribers would like a subscriber listing with listings according to country and Zip Code numbers. This would offer the opportunity to contact CPN members who live close by and share CP news and exchange of plants. We intend to provide such a computer listing after the present Volume 5 is completely subscribed. An announcement will be made in a future CPN issue.

NOTICE OF CHANGE OF COMMERCIAL ADDRESS: Retail inquiries formerly directed to Insectivorous Botanical Gardens of Wilmington, NC, should now be addressed: Northrop's Insectivorous Plant Farm, P.O.Box 5, Hampstead, NC 28443. They state they "only send top quality field grown plants."

JAY BRODIE (10 Brookside Drive, Apt. 3H, Greenwich, CT 06830) wrote a very complimentary letter about CPN. He also endorses the concept of interlibrary loans whereby smaller libraries can obtain a CP book from a larger library on your request. There is frequently a modest charge, perhaps up to twenty-five cents. Jay would like to correspond with younger subscribers such as himself.

NANDA FLEMING is a student at Marlboro College and is completing her senior thesis on CP, entitled "A Literature Survey of Research Carried Out on Carnivorous Plants since 1942." She says she wishes she had known of Lynn Macey's KWIC project before she had started! (See CPN 5:2) The paper is a survey of CP genera that covers a wide range of botanical properties. Over the preceding two years, she has compiled her own species list with distribution, synonymy, karyology and a bibliography of research since 1942 (Lloyd).

JACQUES HALDI sends notification of a book recently published on the carnivorous fungi, entitled Rauberische Pilze Im Boden by Dr. Habil. Asmus Dowe (presumably in German) and available from Die Neve Brehm-Bucherei, A. Ziemsen Verlag, (DDR) Wittenberg Lutherstadt (Deutschland). Inquire about prices in your currency plus postage. There are many photomicrographs.

Although an anecdotal observation, SCOTT HENDRIX feels that the long, narrow petiole form of Dionaea responds better to cultivation, even in high humidity and good light, as compared to broad petiole forms. He wonders if others have noticed this difference.

TERRY BROKENBRO sends us an article taken from the Daily Telegraph which is published in England. It is an article entitled "Where Few Men Have Trod" with many color photographs taken by Adrian Warren. Essentially, it describes the Auyan-tepui in southeastern Venezuela near the impressive Angel Falls which hurls water down into a gorge from 3,212 feet! This article appeared in the February 27, 1976 issue of this paper. This area was once a vast sandstone stretch of several thousand square miles with rock formations considered to be the oldest on this planet--about 1,700,000,000 years. This plateau was broken up by water erosion into crumbling units that drain into the vast river systems of the Orinoco and Amazon. Now it is dotted with isolated plateaus scattered about, on which many plants and animals exist in isolation creating conditions for evolution to take place. On such plateaus Heliophora species can be found and many other unusual plants and animals found nowhere else.

ED GRIFFIN reported to us about some purple spots on the leaves of his Nepenthes plants which seem to spread quite rapidly. He took a sample to his local USDA office and found out it was a parasitic algae known only in Florida. Cephaluros virescens is probably the culprit, and treatment is to spray the leaves with copper solution. Ed used one-half the recommended dosage and noted no phytotoxicity so far. Apparently, this algae can only live in the extreme southern area of Florida but it is wise to watch for this pest on our own plants since they grow under artificial Floridian conditions.

SHORT NOTES

A SELECTED LISTING OF BOTANICAL GARDENS GROWING CARNIVOROUS PLANTS

For the information of new subscribers, CPN began conducting a yearly poll on various issues, the poll questionnaire sent out with the renewal page in September. The 1975 poll was a request for a listing of botanical gardens with significant CP collections that could be viewed by the traveling CP enthusiast. Private collections (even with the permission of the grower) and very small growings would not be included.

The response was quite limited, mainly to certain well-known institutions here and abroad. We were puzzled by so little response until several botanical gardens informed us that they had removed their collections from public viewing areas due to frequent vandalism, a logical problem which we frankly had not previously considered. Even so, most CPN subscribers would be admitted to non-public areas or "prop houses" in the company of a gardener.

We anticipate a flood of letters wondering why we have not listed your favorite garden, and the answer is that we did not know about it, or perhaps the garden prefers to keep the public away from its CP. If you care to add to this list, considering the above restrictions on private and very small collections, we will accumulate your letters on this and amend the list at a later date.

UNITED STATES

Berkeley Botanic Garden
Strawberry Canyon
University of California
Berkeley, CA 94720

Sea World
1720 South Shores Road
Mission Bay
San Diego, CA 92109

Greenhouse
Humboldt State University
Arcata, CA 95521

Greenhouses
California State University
Fullerton, CA 92634

Representatives of all genera except Genlisea, many genera represented very extensively.

Darlingtonia, Sarracenia, Nepenthes, Drosera, Dionaea, Pinguicula. Also graphic display.

"Small but fairly good collection of CP"

Large numbers of Sarracenia, Drosera, Nepenthes, etc. (See exchange list)
Mon.-Fri. 9-5, appointment (714-870-2766)

Denver Botanical Gardens
903 York Street
Denver, CO

Brookside Gardens
1500 Glennallen Drive
Wheaton, MD 20906
(In Wheaton Regional Park)

Botanical Gardens
University of Michigan
Ann Arbor, MI

Missouri Botanical Garden
St. Louis, MO

Brooklyn Botanical Garden
1000 Washington Avenue
Brooklyn, NY 11225

North Carolina Botanical Garden
University of North Carolina
Chapel Hill, NC 27514

UNC Asheville Botanical Garden
(Adjacent to campus)
Asheville, NC

Longwood Gardens
Kennett Square, PA

Nepenthes, Cephalotus, Drosera

Drosera, Dionaea, Sarracenia,
Cephalotus, Pinguicula,
Nepenthes

Sarracenia, Darlingtonia, Cephalotus,
Dionaea, Utricularia, Drosera,
Pinguicula (Announce CPN affiliation
to assistant director)

Nepenthes, Drosera, Dionaea, few
Sarracenia. Ask to see.

Good, developing collection, well
grown

All US genera with most species.
Greenhouse and outdoor habitat
plantings; excellent.

Sarracenias, Droseras, Dionaea,
scattered in habitat plantings

Long known for its outstanding
Nepenthes collection in public
and "prop" houses.

AUSTRALIA

Royal Botanic Gardens
Sydney, N.S.W.

Royal Botanic Gardens
South Yarra, SE 1
Melbourne, Victoria

Botanic Garden
North Terrace
Adelaide, S.A.
(From a 1967 reference; no current
specifics)

CANADA

Montreal Botanic Garden
4101 Sherbrooke St. E.
Montreal, Quebec

(No specifics)

GERMANY

Botanischer Garten
Munchen, Germany

Frankfurter Palmengarten
D-6 Frankfurt (M)
Siesmayerstr. 61

Heliamphora, Sarracenia, Drosera,
Nepenthes, Dionaea, Aldrovanda,
Diosphyllum, Byblis, Cephalotus,
Pinguicula, Utricularis
Botanischer Garten
D-1 Berlin 33
Konigin-Luise-Str. 6-8

GREAT BRITAIN

Royal Botanic Gardens
Kew, Surrey

Oxford Botanical Gardens
Oxford University

Cambridge Botanical Gardens
Cambridge University

Well known for rather complete
collection.

Drosera, Sarracenia, Dionaea,
Pinguicula, "etc."

Edinburgh Botanical Gardens
Edinburgh 3, Scotland

IRELAND

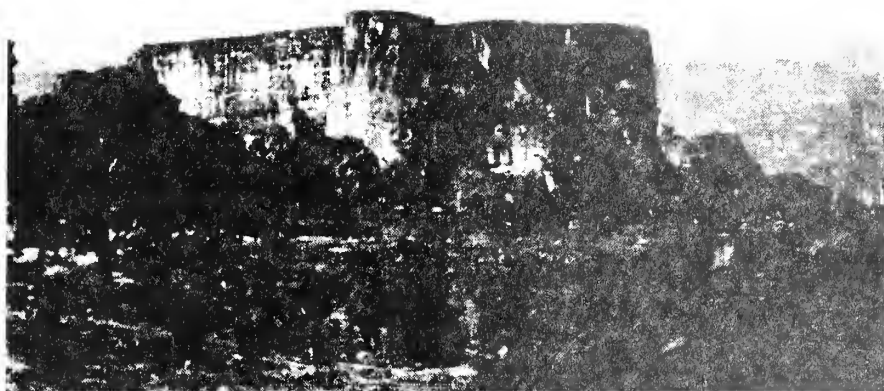
National Botanic Gardens
Glasnevin, Dublin 9

(From a 1967 reference; no current
information)

NEW ZEALAND

The botanic Garden
Auckland

(From a 1967 reference; no current
information)



Summit of Auyan-tepui



Heliamphora heterodoxa in
natural habitat on the sum-
mit of Auyan-tepui.

Photos by J. BOGNER



THE NATURAL HABITAT OF HELIAMPHORA HETERODOXA STEYERMARK

by J. Bogner

In February of 1975, I was able to join Prof. Dr. V. Vareschi, Mr. O. Huber and wife, as well as several Indian carriers of the Kamarakoto tribe in order to climb up the Auyán-tepuí in the Estado Bolívar, Venezuela. The trip and climb up from Kamarata to the summit plateau took three and one-half days.

The Auyán-tepuí is one of the largest tepuís within the Pan-tepuí area which is located in southern Venezuela. The Auyán-tepuí is a typical tepuí having a flat plateau summit and surrounded by high vertical cliffs composed of pink to red sandstone. The summit plateau is divided by deep canyons and crevices, has bogs, creeks and small streams and wooded areas as well as parts with low vegetation. The total area of the summit plateau is about 700 sq. km. and the highest point is approximately 2500 meters (8250 ft.). In the northern part one finds the Angel Falls with a height of about 1000 meters (3300 ft.) which is the highest waterfall in the world.

On the summit plateau, at about 2400 meters (7920 ft.), Heliamphora heterodoxa grows in full sunlight. The plants have reddish pitchers and where shaded, they were more or less greenish. The flowers have a white color but turn reddish after anthesis.

Heliamphora heterodoxa grows in humus accumulations which have been formed in flat depressions of sandstone. These humus accumulations consist of a peat substrate like black peat. The soil is very acid and poor in nutrients. The middle year temperature is 14°-15° C. (57°-59°F.), and a minimum of 4° C. (38°F.) has been established. The relative humidity is high because there are often fogs on the summit plateau. Also, during the dry season, fog usually covers the summit plateau in the early morning and forenoon and then often it becomes clear at midday. The habitat of Heliamphora heterodoxa is very wet or boggy and often the plants stand several centimeters in water which normally cannot flow off from the depressions of sandstone. The accumulated humus is never deep. Heliamphora heterodoxa grows there in large masses with Stegolepis, Paepalanthus, Tepuia, Xyris, Cyrtilla, Tofieldia, Nietneria, Cottendorfia, Brocchinia, etc.

In cultivation we grow Heliamphora species (H. nutans, H. minor and H. heterodoxa) in a cool house in pure Sphagnum moss. The plants stand in pots which are set in saucers of rainwater or in wet moss. Heliamphoras require a high humidity and one may attach a glass bell over them or place them in a covered frame which can hold an adequate humidity. The plants have relatively few roots to leaf mass. Also, Heliamphoras demand much light, and we shade the sunshine from spring until autumn in late forenoon and remove the shade in the early afternoon (conditions in South Germany). As to temperature, approximately 10°C. (50°F.) is best in winter, and during summer the temperature is increased appropriately with the weather. We have been cultivating Heliamphoras successfully with these simple methods for decades of years.

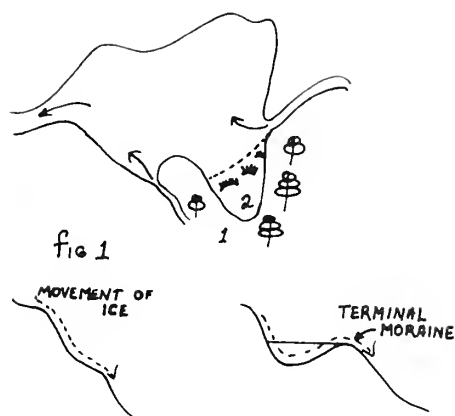
PEAT BOG FORMATION

by Terry Brokenbro

Although the formation of the peat bog is as varied as CP themselves, basically there are two types, the formation of which I have set out below:

THE SEDGE BOG: The sedge bog will mainly start its formation with a shallow lake, usually with an inlet and outlet of water. Through its history, the inlet brings nutrients to the gradually dying lake. See Fig. 1. The decline usually begins at the shallow edge of the lake (1) where sediment from deciduous trees and dying sedges collects and allows the gradual encroachment of willows and other moisture-loving perennials. With the passing of thousands of years and repetition of this process, the lake will eventually become completely filled and covered by deciduous forest. However, it is while this process actually takes place that is of particular interest to the CP enthusiast. At the actual place of peat formation (2) will be found CP and other acid-loving perennials, e.g. Erica. As this process develops, the CP will eventually only grow where the acid streams now exist.

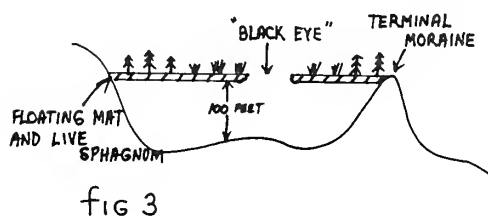
THE SPHAGNUM BOG: Although the formation of the sphagnum bog is similar to that of the sedge bog, it differs in the fact that it is very much more acid and therefore generally richer in CP. One reason for this high acid content is that many sphagnum bogs do not have an inlet and outlet of water. Many sphagnum bogs found today are in fact lakes which were created by ice erosion during the last ice age (see Fig. 2). Sphagnum moss will often first take hold on the terminal moraine, which is usually the lowest part of the lake shore where excess water from the lake will drain away. Logically, this is therefore the most wet area. CP may even be found growing here at this stage of the bog. As reeds and other vegetation die, a mat of vegetation is formed into which grows sphagnum and other binding agents collecting into a floating mass upon the lake surface (see Fig. 3). Usually this mat never exceeds several feet in thickness and as the process continues, pine forest will



follow the advancing sedges, CP and other acid-loving perennials. Finally, small pockets of water will remain, known in Germany as "black eyes" which are aptly named as these will often descend to one hundred feet or more.

If you think you have found one of these "hidden" lakes on a CP field trip, a simple test will reveal all. Find a clump of small pine trees and jump up and down near them. The sphagnum moss should give way a little under your weight and shortly you will begin to actually see the trees sway to and fro.

To stress Don Schnell's views in Volume IV, No. 3, page 42, "that habitat destruction, so rampant and efficient in this age, is the chief threat to most CP."



THE CARNIVOROUS PLANTS OF ALBANY, WESTERN AUSTRALIA

by Doreen Davidson

For those contemplating growing West Australian CP's, particularly from the Albany area, a few weather statistics may be helpful. Generally speaking, Albany has a very mild climate. Winter, the growing season, is cold and wet, but frosts are very rare; and summer temperatures are kept moderate by sea breezes; seldom do we experience temperatures above 38° C. (100°F.) on more than three days each summer. However, many CP's growing under these conditions also extend into areas of light frost and high summer temperatures. The average maximum and minimum temperatures and rainfall for Albany are as follows:

January	23.2° C. (73° F.)	14.7° C. (59° F.)	19 mm. (0.75 in.)
February	23.4° C. (74° F.)	14.9° C. (59° F.)	22.2 mm. (0.87 in.)
March	22.3° C. (72° F.)	14.2° C. (57.5° F.)	34.8 mm. (1.37 in.)
April	21.3° C. (69° F.)	12.4° C. (52° F.)	71.6 mm. (2.75 in.)
May	18.8° C. (66° F.)	10.4° C. (50° F.)	93.0 mm. (3.62 in.)
June	16.8° C. (63° F.)	8.8° C. (48° F.)	105.4 mm. (4.25 in.)
July	16.1° C. (60° F.)	7.9° C. (46° F.)	117.6 mm. (4.62 in.)
August	16.5° C. (62° F.)	8.1° C. (46° F.)	114.6 mm. (4.12 in.)
September	17.6° C. (63° F.)	9.1° C. (48° F.)	84.0 mm. (3.37 in.)
October	18.7° C. (65° F.)	10.0° C. (50° F.)	84.0 mm. (3.37 in.)
November	20.7° C. (68° F.)	12.0° C. (54° F.)	46.0 mm. (1.75 in.)
December	22.2° C. (72° F.)	13.7° C. (57° F.)	35.0 mm. (1.37 in.)

The average yearly rainfall is 827.8 mm. (32.8 in.).

The most common Drosera is D. erythrorhiza which grows in such a variety of soils and situations that it would probably be most adaptable for culture. It forms colonies in dense shade, semi-shade or full sun; in sandy limestone areas, heathlands, light forest, in pockets of soil among granite rocks, on the edges of swamps and within reach of sea spray. Almost anywhere, in fact, except in very wet areas.

Another common species, D. pallida, grows in similar areas, but favors a situation where it can cling to supporting shrubs which also provide shade, and hence, cool soil for the dormant tuber in summer. Growing up to five feet tall, this "rainbow" is conspicuous along many road verges, particularly when the sun follows rain. Favoring slightly damper areas is D. glanduligera which grows in a diversity of soils such as clay, gravelly loam, on the edges of peat swamps and areas of seepage. D. bulbosa is more selective in its habitat, growing in wet sandy flats in an open situation with D. sunhirtella and Utricularia menziesii. The area with which I am familiar supports very little other vegetation--a few stunted melaleucas and sparse rush-type growth, so the lack of shelter from other plants must result in high ground temperatures during the summer resting period.

Looking like a host of miniature Father Christmases, Utricularia menziesii is a small gem which grows in mossy cushions on granite rocks, or wet sandy flats. The situation in which these plants grow assure them of the benefit of any rain which falls; but the very exposed habitat, particularly in the shallow depressions on granite, must subject the dormant plant to a baking during summer, a fact which would probably have to be considered in cultivation.

Utricularia volubilis sends up a flowering scape which twines around the rushes in peaty, swamp areas. Cephalotus which grows nearby favors tussocks where its head is out of water, but U. volubilis prefers to stand in shallow water or very wet situations.

The two species of Polypompholyx--P. tenella and P. multifida--inhabit areas of seepage on hillsides, the latter forming a carpet of color in some areas. P. multifida also likes damp peaty areas, among shrubs such as Callistemon speciosus and Leptospermum firmium.

NEPENTHES CHASING IN SINGAPORE

by Bill Hanna

Before going on holidays I had been busily writing to various people, universities and botanic gardens in the places I was going with the hope of finding someone with an interest in, or who grows carnivorous plants, particularly Nepenthes. The only success I had was in Singapore--with the Botanic Gardens, and with a local businessman, Jimmy, who whilst having no interest in carnivorous plants, had a knowledge of them. The first day in Singapore was spent trying to get in contact with these people. First off I caught a taxi down to Jimmy's office. Instead of ending up there, I ended up at an Indian Department Store in a slum section of town quite some miles away. Upon arriving at Jimmy's office I was to learn that he had troubles in one of his mines and had to fly up to Malaysia to deal with them but hoped to be back very soon. Going down to the Botanic Gardens I met one of the botanists there who was very helpful. I arranged to go back to the Gardens to photograph their plants. The plants were kept in a bush house which was out of the way somewhat and heavily barred and locked. Here the three Nepenthes varieties that were here were grown to what in my mind had to be perfection: so robust, green and covered with large pitchers. Going back to the office, we then had a discussion regarding the Nepenthes and here are the main points of what she had to say. In Singapore there are three varieties of Nepenthes: ampullaria, gracilis, and rafflesiana. However, it is the official policy of the Singapore government to rid the island of Nepenthes, this a result of a ruling by the Ministry of the Environment that they were a potential breeding ground for mosquitos although she said to her knowledge she knew of no mosquitos or their larvae in Singapore that were immune to their digestive juices. They enforce this ruling by spraying them thoroughly or physically clearing them completely. But nevertheless, there are still some to be found, particularly in water catchment areas and along cliffs facing the sea on the west coast, particularly on the island of Sentosa. They are found in the secondary jungle. Here they grow in lateritic clays. The cliff faces are pretty dry and the catchments are boggy. The temperature in Singapore remains fairly constant at 70-75°F. and so does the humidity at 90-95%. The rainfall is from 70-80" per year with an even distribution slightly favoring the end of the year. At the gardens the Nepenthes are grown in a mixture of burnt clay, leaf mold and organic manure. They are fertilized once a fortnight with a small amount of nalotin and are watered twice daily. They have propagated them by striking cuttings in moist sand but have made no attempt at growing them from seed. She has been collecting on Mount Kinabalu which apparently is "THE" place to go for Nepenthes. Having read books which tell of Malaya's Nepenthes, which have been known to consume birds and rodents, I asked her about this. She said the largest thing she had come across in a pitcher was a small lizard, but there was a large range of insects. The only other thing she had to say was that the pitchers had a deeper mottling in the shade. At the end of our discussion she was kind enough to ask if I would like to see them out in the jungle, so she arranged for the garden's chief specimen collector to take me out the next day.

I turned up the next morning armed to the teeth with camera equipment and film. It looked stormy and by the time to leave we were in the middle of a tropical downpour which lasted for half of the day. But as opportunity never knocks twice, I decided to press on.

To my surprise, this secondary jungle was only about fifteen minutes out from the Botanic Gardens. Here the soil was yellow clay with up to 6" of leaves covering it. It was quite heavily shaded, the ground was moist but not visibly marshy although the town reservoir was only 300 yards away, so the water table was probably fairly high. Here the rafflesiana was relatively rare for we only came across three plants. Gracilis was most common. Ampullaria was squat while small--there was no evidence of the plant--just pitchers. The land around the walkways had been cleared of Nepenthes and my guide expressed amazement at the quantity that had disappeared. There was evidence of some small plants of gracilis coming up from seed in the cleared areas. I managed to take pictures of plants by using a flashlight, for in the jungle with the rain it was pitch black. The results were quite surprising. The biggest vine we saw was about 20' high. The biggest rafflesiana pitcher I saw was about 9" long, the smallest 4". There were three different types. The largest ampullaria was about 3", the smallest 1/2". The gracilis ranged from 1/4" to 6". The real excitement for the day came on our way out of the secondary jungle when we managed to get caught in the middle of an Army exercise. Four huge black Doberman pinschers came bounding up at us. Behind them came a group of Singapore soldiers, all carrying large black machine guns. Two of them were being dragged by two Dobermans which were on chains. As the dogs were about four or five feet from us, their masters yelled out to them in Chinese, or Malay, and they stopped dead in their tracks. We stopped in ours when we first saw and heard them. All I can say is thank goodness their trainers did not stutter; otherwise, I think we would have been in big trouble.

Next day, Jimmy rang me at the hotel to ask if he could come around and see me. He put himself at my disposal for the afternoon. As he was obviously a very successful businessman, I dressed accordingly to meet him with a great pile of clothes I had tailor made in Hong Kong, from my Spanish antelope coat to my calfskin shoes. We drove around the town visiting a number of shops. After this, he suggested we have a look at some Nepenthes. We drove to the back of the University--a construction site. Here we waded through thick greasy orange clay and pushed our way through rain-soaked scrub. Again gracilis proved to be the most common but no plant was more than 5" long. There were two plants of ampullaria but these were only small. The soil was gravelly orange clay and damp from seepage. The fate of the Nepenthes here was sealed, for this area was about to be absorbed into the University. The coloration of the gracilis varied from intense reds and oranges to greens. Sometimes the reds were in shaded areas, sometimes in the sun, and vice versa with the greens. For this I shall not try to offer any explanation. Jimmy informs me that two years ago rafflesiana grew here. Today they are all gone. He told of another round-leaved Nepenthes. With finding these in mind, we drove to another site about half a mile away near the top of an abandoned quarry. Here the soil was still developing. It consisted of ironstone and quartz. Gracilis again was the most common, the plants ranging from 1/2" diameter seedlings to 50' high vines covering the trees. The only seed pods for the whole trip were observed on four plants, about half a dozen--all seed had gone bar two lots. Only one plant of ampullaria was found here. It had a 1/2" diameter stalk with 12-18" leaves. The plant was 5' high with only one pitcher on the bottom leaf. This seemed strange for the plant looked to be a perfect specimen. Here the sunlight was more direct as there were not many shady trees. The size of the pitchers on the gracilis ranged from 1/8" to 12". We then went to a reserve to see a cliff face of Nepenthes but unfortunately the government beat us to it and the cliff was now a nice grassy one and all the Nepenthes were gone. These round-leaved Nepenthes and rafflesiana eluded us. On the last day of our stay in Singapore Jimmy came around again to see us and took us out for a last attempt to find the above. I do not know the name of the place we went, but we were successful in our quest. Here the soil appeared to be yellow clay, but on examination it was very much like sand. Again there was plenty of ironstone and white quartz. As per usual, gracilis was the most common. We found five plants of ampullaria. These overall appeared to prefer a soil with an A00-A0 horizon. We found one seedling about 6" in diameter of rafflesiana which grew under a small shrub where it was heavily shaded. Finally a cry came out of Jimmy--he had found it, the round-leaved Nepenthes. There were two small seedlings on a half buried stem. The pitchers appeared very similar to gracilis--they were red-orange in color. To pick a difference I would say perhaps they had more hairs on the alae of the pitchers which seemed more bulbous, but I would not say they were not a form of gracilis, although gracilis seedlings the same size seemed to have straight pointed leaves. Ampullaria seems to produce more pitchers when young. Upon driving back to the hotel, we were to learn that the land where we had been was soon to be used for high rise housing development.

Before leaving for the trip I had read Dr. P. A. Zahl's article on "Malaysia's Giant Flowers and Insect Trapping Plants" in the May, 1964 edition of National Geographic in which I saw the author quaffing the contents of a sanguinea pitcher. The idea appealed, but not being as adventurous as Dr. Zahl, I stuck to sealed pitchers. The ampullaria's contents were very viscous, mucus like, the taste very acid. It caused a slight burning sensation on the tongue but was not unpalatable. The gracilis was just

like ordinary water. The other two had no pitchers on them still sealed, and not being too adventurous, I resisted the temptation to sample these.

Since returning home, I have been told that actually five different Nepenthes grow in Singapore, the other two being two crosses - a Nepenthes hookeriana and another natural hybrid. Perhaps the round-leaved one was one of these. However, I wrote away inquiring about these two plants and managed to get in contact with the Garden's chief specimen collector, Mahmud. In his reply, he informed me: "There is a Nepenthes hookeriana not in Singapore but in Borneo and Malaysia." Unfortunately he makes no mention of the other one. Just who is right I do not know. Mahmud has been working for the Gardens for 27 years and is extremely knowledgeable about all types of plants. The botanist has an M.Sc. and at the time I was speaking to her she did not know of them. However, the existence of another two Nepenthes on Singapore comes from a paper written in the early 1960's on an analysis of Singapore's Nepenthes by Sally Green.

The Botanic Gardens at Singapore in an effort to increase its collection of carnivorous plants has expressed a willingness to swap the local Nepenthes for other carnivorous plants. If you would like to obtain plants or seed, write to: Miss S.Y.Geh, Botanic Gardens, Cluny Road, Singapore 10, Republic of Singapore.

FIELD OBSERVATION OF WINTERING UTRICULARIA VULGARIS by A. Roger Kirby

While passing through northern Virginia on a recent trip to Maryland, I spotted several swampy areas that I felt needed a closer look for any CP's that might be there in winter bud. After marking the mileage from different points, I continued on, planning to stop on my way back.

Leaving Maryland on Monday morning, I drove into Virginia and proceeded to one of the areas I had marked by mileage. Upon arriving at the first bog I noticed the bog had little water in it for this time of year. I slipped on my hip boots, grabbed a five gallon bucket and walked into the shallow water and mud of the swamp. I immediately noticed Utricularia all over the bottom of the bog. I started gathering and putting them into the five gallon bucket. The plants were approximately twelve inches long, or six inches on each side of their "Y" form, and at the crown was the dark green whorled winter bud. I gathered the plants until I had the five gallon bucket about one-third to one-half full. I left the swamp for the car and I checked my watch and realized I had only taken twelve minutes to do all I did. I looked closer at the Utricularias and recognized them to be U. vulgaris because of the very large bladders, some 1/8" long in size, or 4-5 mm. x 2 mm. wide.

I had only covered a few square yards and due to the enormity of the swamp, it would take a full day to check it out more thoroughly for additional species of CP's.

I now plan to return in the spring to take a closer look when the plants are in bloom. I feel more Utricularia species are there and I also plan to take pictures. This seems a great place for CP enthusiasts, so I will let CPN know of my progress.

OBSERVATIONS OF TRICHOPTILUS PARVULUS AND DROSERA by Grady Lucas

It seems that not all insects will succumb to the carnivorous nature of Drosera. One of these insects is the caterpillar of the moth Trichoptilus parvulus. This moth is a fairly small representative of the phylum pterophoridae, or "plume" moths.

Although many insects are known to be associated with Sarracenia and other carnivores, few are known to be associated with Drosera. There have been reports of a moth larva of the family Noctuidae which might feed on the plant, but these apparently crawl only on the landless portions of the plant. Certain Australian Hemiptera of the family Capsidae are said to feed on the juices of arthropods caught by Drosera and are able to move about the leaves without any apparent difficulty.

After hatching from their eggs the larvae are no more than 1.5 mm. long, and their larval life will usually last about eight days.

Usually the first sign of Trichoptilus is that the leaves seem to have been chewed away, and pellets which look like fecal matter litter the surface of the leaves. The caterpillars apparently stay hidden under the sphagnum moss during the day and come out at night to feed.

The main food of the younger larvae seems to be the stalked gland itself, whereas the older larvae will not stop at just the stalk and will usually eat the leaf blade as well. They may also eat the remains of captured insects. It may take from 10-20 minutes for a

larva to eat a single stalk. Once finished with this stalk it will move on to an adjacent one and continue. In this manner an entire leaf can easily be stripped in a few hours. For some reason, the longer marginal glands are either ignored or eaten last.

The larvae are usually a grayish-brown in color, though the color can vary considerably depending on what material the larva has been eating and which can be seen through the semi-translucent body wall. Therefore, younger larvae tend to be red or purple, from eating the stalked gland, whereas the older larvae are greenish due to the color of the ingested leaf blade.

How does the larva avoid being trapped in the secretion? This is not as difficult as it seems. The body of the larva hardly ever touches the secretion, and if it did, it would become entrapped just as any other insect would be. The caterpillar's contact with the droplets is restricted to its bristles which stick out from its body. The bristles can readily be withdrawn from the secretion. Older larvae avoid body contact but because of their great size can escape without difficulty.

Pupation usually occurs on the flower stalk. The pupae which are light green in color, hang head down from the floral stalk and the adult emerges 10-12 days later.

A good deal remains to be learned about Trichoptilus parvulus. For instance, one wonders how the female lays her eggs on the plant without becoming entrapped herself. Of course, she could lay her eggs beside the plant, but the possibility that she oviposits directly on the plant need not be ruled out. It has been found that moths are among the most unlikely of all insects to be captured by Drosera, although I have seen it happen several times. The detachable scales with which moths are characteristically covered and which are known to protect them from adhesion to spider webs might also be why they are so seldom caught by Drosera. When a moth flutters into the leaf of Drosera, it merely releases some of the scales to the viscid secretion and flies on. Adult Trichoptilus must therefore be able to easily approach Drosera with at least some measure of caution.

PYGMY DROSERAS

by Rich Sivertsen

Pygmy Droseras are not necessarily characterized by small size, but primarily by their ability to produce gemmae. They are the only Droseras that do so. Except for D. pygmaea which extends into Tasmania, New Zealand and neighboring islands, all pygmy Droseras grow in southwestern Australia.

In cultivation, seeds are often difficult to obtain in spite of the plants' prolific flowering habit; and the seed is even more difficult to germinate and grow plants to maturity. Methods of propagating these plants from cuttings are not reliable, and are possibly damaging to the parent plant.

The best way to propagate these plants is to encourage, harvest and use gemmae. In constant temperature-light conditions, they will grow for years and produce an abundance of flowers periodically, but generally few or no gemmae. The stimulus needed is the transition from warm temperatures (70-85°F.)--low intensity light environment (such as a fluorescent light chamber) into a cool (38-65°F.)--high intensity light, or full direct sunlight for at least three to four hours daily. Some species may require an even longer photoperiod to produce gemmae.

During gemmification, the first noticeable changes in the plants is swelling of the apex in the center of the rosette. Within a week to ten days, gemmae will be visible within the apex as it opens up to form a nestlike cluster. These gemmae should now be carefully removed and pushed just below the surface of moist peat and placed under a controlled environment, such as fluorescent lights. The peat medium should be prepared about three weeks in advance to allow a plentiful culture of small soil organisms to develop. The young pygmy Droseras will capture these for nutriment and grow faster and better for it. They will mature in about six months in this environment, and given the proper conditions are able to in turn produce gemmae of their own at that time.

Humidity is not essential for gemmae production nor is the amount of watering an important factor. Warming of the peat by sunlight causes no harm either since pygmy Droseras often grow in sands in the wild that are too hot to walk on barefoot. Peat seems to be the best all around medium in my experience.

Gemmae are of different shape, size and color (lighter to darker shades of green) depending on species. D. paleacea gemmae are spherical to oval and light green. D. pulchella gemmae are flat discs resembling small fish scales and dark green. Stipules may or may not disappear during gemmae production depending on the individual or species.

After all the large, ripe gemmae are removed from an apex, more will be produced for several crops as long as proper conditions are maintained. Extreme care and patience are required

along with the steady hand as of a competent surgeon in removing the gemmae from the apex. Often they will be hurled by the remaining stipules so quickly they seem to vanish as they are thrown out of sight. A few weeks later, foreign visitors are then noticed in other pots.

SPECIAL NOTICES

BACK ISSUE REPRINTS AGAIN AVAILABLE - LEO SONG (Arboretum, California State University, 800 North State College Blvd, Fullerton, CA 92634) has undertaken reprinting of back issues of CPN. Original copy supplies were exhausted long ago and the co-editors do not anticipate a reprinting since this would involve capital outlay and maintaining an expensive inventory. In the past, Roger Kirby produced one reprinting of back issues but has decided not to print more. Leo Song is taking up reprinting with the co-editors' permission, but the project is being handled completely by him and the co-editors and CPN have no financial interest. Leo will handle all orders at the following rates:

\$5.00 per volume	in U.S.	surface
\$6.00 per volume	out of U.S.	postpaid air
\$18.00 for all four back volumes	in U.S.	surface
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Note that all prices are postpaid and only entire volumes will be sold. The four CPN's of each volume have been reprinted consecutively and are stapled as one volume. Send all orders with your check directly to Leo at the above address. Please do not send orders to the co-editors.

NEPENTHES CUTTINGS-1976 - JOE MAZIRMAS and DON SCHNELL have completed pruning of their Nepenthes plants for this year and cuttings are now being mailed to those who sent a note to Joe earlier. There will be no additional cuttings this year, but watch for an announcement in CPN regarding cuttings for next spring (the announcement will probably be in the December CPN).

RECENT LITERATURE

(Anon.) Do sundews really devour insects? Australian Plants 8:161-162. 1975.

A second-hand report on research of Chandler and Anderson of La Trobe University, Victoria (reference not given). Unnamed Drosera ssp. reportedly grew 30% more than controls if fed with insects or nitrogen compounds. Sundews kept under bacteria-free conditions could only digest insects to a limited extent.

(Anon.) Growing Cephalotus follicularis, the Albany pitcher plant. Australian Plants 8:172. 1975.

A resume of a culture method, primarily in pots of peat outdoors in the Sydney area. Pots were placed in saucers of water and in full light which resulted in healthier pitchers. No fertilizers were used. Occasional freezing by light frost did no harm. Propagation by rhizome division, though slow due to slow growth of the species, is preferred over seed since seed are very difficult to germinate. Disturbance during division or transplant frequently results in dieback of topgrowth, but new growth resumes promptly.

Fox, William W.: Pygmy Forest: an ecological staircase. Cal. Geology 29(1):3-7. 1976.

History and evolution of the five uplifted marine terraces near Ft. Bragg, CA which are where sphagnum moss bogs form. These are the most southerly habitat in the west coast and are sterile and low in oxygen. The moss is also nearly devoid of bacteria so that peat is formed by compression of its own weight. Here we find Drosera rotundifolia growing.

Fromm-Trinta, E.: Ecological study of the sandy coastal plain flora of southeastern Brazil: XXI Lentibulariaceae. Conselho de Pesquisas da Universidade: Rio de Janeiro, Brazil, 1972.

There are eight species of Utricularia on the restingas of S.E. Brazil: U. subulata, U. fimbriata, U. longifolia, U. erectiflora, U. foliosa, U. gibba ssp. gibba, U. tricolor, and U. nephrophylla.

Heslop-Harrison, Y.: Enzyme release in carnivorous plants. Lysosomes in Biology and Pathology, Chap. 16. J.T. Dingle and R.T. Dean, Eds., Amer. Elsevier Pub. Co., N.Y., 1975.

This chapter gives a thorough review of all the evidence for digestive glands and their secretory products in many genera of CP. Darlingtonia and Heliamphora are not discussed. Scanning electron micrographs are liberally scattered throughout this work. Cytochemical localization of digestive enzymes and the mechanism of the secretory process are discussed by the author in detail. An indispensable background for those who wish to pursue CP digestive biochemistry and relate it to fine structure.

Komiya, S.: On development of the glands of the capture organs in the Lentibulariaceae. Bull. Nip. Dental Col. No. 4, 199-215. 1975

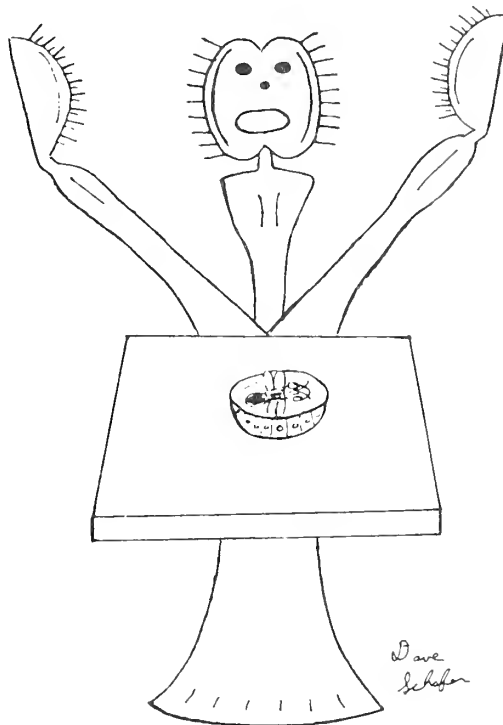
The author studied both Utricularia and Pinguicula. All the glands of the capture organs are of epidermal origin. The sessile gland of Pinguicula and the bifid or quadrifid hair on the inner wall of the Utricularia bladder originates from an epidermal cell. The stalked gland of Pinguicula and stalked glandular hair around the outside of the Utricularia trap originates from a protuberance of an epidermal cell much later.

Miles, D.H.; Kokpol, U.; Hedin, Paul and Mody, Naresh: Volatiles in Sarracenia flava. Phytochemistry (OXF) 14(3): 845-846. 1975.

Gas chromatography of the volatiles showed about 100 compounds. Only 32 of the most abundant compounds were identified which included aliphatic and aromatic hydrocarbons, alcohols, phenols, carbonyl compounds. Others were unknown amines and miscellaneous compounds.



HEY WAITER,
THERE'S SOME SOUP ON MY FLY!

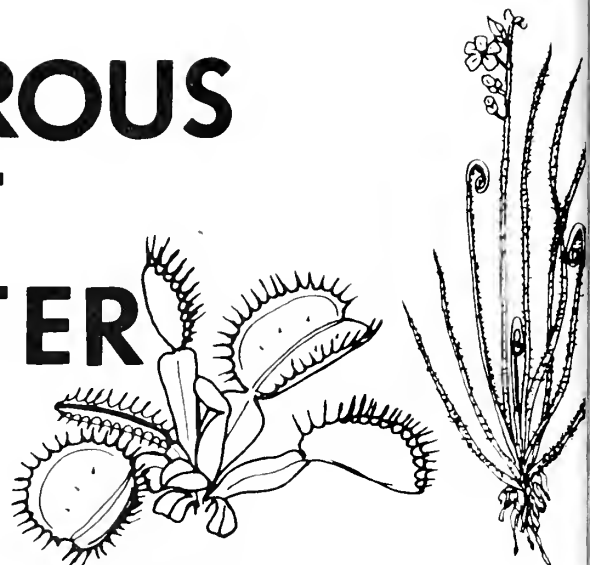




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CO-EDITORS: D. E. Schnell, Rt. 4, Box 275B, Statesville, NC 28677 USA
J. A. Mazrimas, 329 Helen Way, Livermore, CA 94550 USA

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STEVE BOSTIC (Botany Department, University of Texas, Austin, TX 78712).
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EDITORS' CORNER

It has been brought to our attention that one of the short notes published in the last (June) issue of CPN (and possibly some others before) was wholly adapted from a previously published journal paper without the properly cited reference source. The short note without such a citation might suggest to most readers that the note represented original work on the part of the author when actually it summarized and quoted from a copyrighted journal paper.

We offer our gratitude to the correspondent who pointed this out to us and our apologies for letting this transgression slip by. We feel that no useful purpose would be served in embarrassing the short note writer by revealing the title and writer's name since we are led to assume that the error was unintentional. However, we must insist on certain standards of citation for all future notes which will be screened more carefully and returned for any corrections. Keeping in mind the informal nature of CPN (although we welcome the fine, complete, more formalized contributions of some past, memorable notes), we would offer the following suggestions to our younger subscribers who may not be well versed in the ethics of such matters concerning citation of references.

First of all, we can use summary or review notes that cover one or more papers that have appeared in a copyrighted technical journal. However, your title must bear the sub-heading, "A Review", and you must give a complete citation of the original paper(s), including author, year, title of paper (if not the same as your review), name of journal, volume and page numbers. We appreciate that our very brief reviews of the current literature are inadequate for those who feel the readership would benefit by a more thorough review of an interesting subject, and you may wish to review an older paper that has not even been mentioned in our recent literature section. Just be absolutely certain that you mention your source in prescribed fashion. Also, any tables, charts, drawings, photos, etc. included in a journal paper are also copyrighted and cannot be reproduced without written permission of the current journal editor. Therefore, do not submit this kind of material with your review unless you can also supply us with a letter giving permission for reproduction in CPN. Finally, if you quote an article directly, you should use quotation marks to so indicate that these are not your own words. These remarks apply to longer reviews of short note character, not the brief one or two sentences appearing beneath reference citations in our current literature section.

In other kinds of news and views notes and short notes, you must also acknowledge statements that are not your own product. If it is only a brief mention and you are too lazy to look up the reference, or if it is something that many people have written and the citation list would be very long, for the informality of CPN a comment such as, "one botanist has noted..." or "it is commonly accepted..." or "I have been told..." or some similar phraseology will be minimally sufficient to alert the reader to where your thoughts leave off and another's begin. In more formal journals, of course, such casual reference would be wholly unacceptable, and as a courtesy to your readers and to the original author(s), it would be preferable to give a reference so that the interested reader might look up the original source. In cases where there are dozens of papers saying the same thing, just mention a few of those that seem more prominent to you. Again, if you quote a phrase, line or paragraph directly, you must enclose in quotes and give your source.

We do not feel that it is the duty of CPN to give courses in writing properly cited articles--this should be done by our admittedly deteriorating high school and college systems which are rapidly acquiring a reputation for graduating essentially illiterate students, all sorts of rationalized reasons of compromise being given for failure to teach a student how to communicate. However, the rules listed above will get you started, as far as CPN goes anyway, and for the rest you will have to use common sense, courtesy and a sense of ethics.

NEWS AND VIEWS

RAY NASH has taken a trip to Western Australia recently and reports: "Last October, I spent ten days in Western Australia with three friends; all orchid cranks with three greatly interested in CP's and before we left W.A., two had been bitten by a new bug, that is the Trigger Plant Bug (Stylidium). I had a taste of this T.P. bug on my previous two visits and so I did not succumb so quickly. We hired a car and traveled down from Perth to Bunbury, Manjinup, Albany and back to Perth via Brookton. All participants had a wonderful time, with four camera shutters working overtime and Mr. Kodak rubbing his hands all the time. I have since found out how difficult it is to identify Drosera, especially the pygmies, from photographs. We had no permits to collect plant material. Some fourteen known Drosera were seen in flower with another four that so far have not been identified, at least one or more of these appear to be unnamed species. Many other Drosera were seen; but without flowers, identification was not proved. Four Utricularias were seen: U. hookeri, U. simplex, U. violacea and possibly U. volubilis (had no twining stem). Both Polypompholyx multifida (very common) and P. tenella (one place only) and Cephalotus follicularis were also seen. At one burnt out swamp, approximately 10 Km. north of Manjinup, we were delighted to find masses of U. hookeri, U. volubilis? and P. multifida growing all together by the thousands. In the same swamp were masses of D. sulphurea and as it was morning all the flowers were open, a delightful scene with white everlasting daisy flowers intermingled with them. I now find Erickson's Plants of Prey a little lacking in that more Drosera and Utricularia occur in Australia than this book covers, especially in the northern part of this large land mass."

C. WHITING writes in response to our editorial and items on conservation: "I find the items on conservation in the USA most interesting. Over here, we tend to think that land is not lacking in the USA. In England, conservation took a big step forward with the new legislation on the CONSERVATION OF WILD CREATURES & WILD PLANTS ACT which became law 1-8-1975. Basically for plants, this means that no one may pick or dig up any wild plant unless the owner of the land or has permission of the owner. In addition, there is a list of endangered species which no one can touch without a permit. Insectivorous plants are not on this list--which of course is a good sign. This does not mean that we are ahead of you in conservation but rather that we are much more overpopulated than your country--a sign of things to come?

I read of Sarracenia purpurea growing wild in Switzerland in a 1930's magazine. Does anyone know of the site or whether it still exists?"

ROBERT GRIESBACH writes: "I am wondering if any other growers have bird problems. In the spring the birds invade the pots pulling apart the sphagnum for nesting material. This spring I have lost fifteen smaller-sized Sarracenia, an entire clump of Pinguicula, and several Droseras. The birds just tear apart the plants letting them dry out in the sun. Maybe the newsletter can warn other members of this potential danger and pest." (Ed. Perhaps one can place some hardware cloth over the pots which admits light and air but prevents birds' beaks from pecking at the plants, especially if the cloth is situated several inches above the plants.)

JOHN TURNBULL: "I would like to pass on this unusual observation regarding germination of tropical Drosera seed. About one year ago I received in trade, a very generous supply of D. spathulata seed. All normal combinations of soil, heat, and lighting failed to break dormancy in any of the seed and I concluded that they had been killed by frost in transit. Last fall I was preparing some D. intermedia seed for the cold treatment, stratification, that they require for germination and decided to plant some of the D. spathulata seed as well. The treatment I normally use for temperate and northern species is to plant the seed in an equal mix, by dry weight, of silica sand and peat, moisten and refrigerate at 4° C. (39° F.) for 2-3 months. At the end of this period they are brought to room temperature and usually begin to germinate in 2-3 weeks. Using this method with D. spathulata, over 600 seeds germinated of an originally estimated 400 planted.

"Subsequent tests with cold treatment of D. brevifolia, D. burmanni, D. capensis, and D. montana, which did germinate well at room temperature, revealed that there was no significant decrease in germination rates using this method. Although I can offer no physiological explanation for this form of dormancy break, I do highly recommend stratification for all northern CP and suggest that no harm is done with some tropicals as well. So, when all else fails, Cool It."

ARNOLD MONETT relates a tragic experience: "Upon regularly checking the humidity in my 55 gallon terrarium, I found a constant but rapid drop in my humidity. It was caused by an uneven piece of glass that I have laying on top of the terrarium to seal in the humidity. I decided to seal the uneven piece of glass with aquarium cement to see what the results would be. I did this before going to bed and the next morning, disaster. I lost dozens of my sundews, several of my Darlingtonia californica, Sarracenia and butterwort Pinguicula. Checking further into this problem, I have realized where I went wrong: it was the aquarium cement releasing acetic acid when drying. I, for one, have learned a lesson and am glad to pass it on; after all, trial and error increases our experience."

DON HOTH sent the following on growing Nepenthes under lights: "I have been growing my Nepenthes gracilis under fluorescent lights for ten months in my greenhouse. I keep the plant in a clear plastic chamber for extra humidity. The plant pot is nested in another pot for added drainage. The greenhouse is made of two-by-two's, is five feet long, four feet high, and three feet wide. The wood is painted white, the floor is made of half-inch plywood also painted white. On the outside is stapled clear plastic dropcloths, and over that is stapled a white bed sheet to reflect the light. The light system is two twin bays, one warm white and one Gro-lux in each fixture.

"The plant is potted in a six-inch pot in milled sphagnum, watered three times a week. I mist foliar feed twice a week with a half teaspoon per pint of fish emulsion in distilled water. I keep the chamber directly under the lights, but cover the top with the aforementioned white cloth to reflect excess light. Since the plant has been under lights, each pitcher has been larger than sun-grown plants. Also, each pitcher under lights has taken on a deep red hue of the lip and all of the hood.

"Too much light will bleach the leaves yellow. Keeping the plant ten inches away from the lights and using the white cloth prevents yellowing. The greenhouse temperature is 80° F. day and 65° F. to 70° F. at night."

ANDY LANIER AND BARRY BROOKS have found an unusual Drosera near West Palm Beach, Florida, growing in a site condemned for development. At first, they thought it might be D. intermedia and were interested because this species has not been reported that far south. Further observation disclosed that the plant did not "stem up" as does D. intermedia, but even in bright light the leaves are only semi-decumbent. The blades and petioles are much like D. intermedia and the flower is pale pink on a very tall stalk. Since the location is destined for construction, Barry will send plants to anyone who is interested in studying them along with us. Write BARRY BROOKS, 19811 NE 19th Avenue, North Miami Beach, FL 33179. BE SURE to include \$1.00 to help defray postage and packing materials. Due to high water, delivery may be delayed as late as December.

Most of us have read in the older literature how northern Europeans used an extract of native Pinguicula sp. to clabber milk and produce an edible material much like a custard, yogurt or junket. Dr. EDGAR WHERRY sent us an ad recently describing the commercial availability of dried starter for such a material, along with recipes which read rather tastily. Once a starter package is mixed with milk or cream and gels, portions of this can be used to continue the process. For information, send a stamped self-addressed envelope to the company here in the US: Piima, Box 2614, LaMesa, CA 92041. The material is called PIIMA and is imported.

While botanizing in Charles County, southern Maryland, MICHAEL HUNT reported large numbers of Drosera intermedia, Drosera filiformis, and some of the largest pitchers of Sarracenia purpurea that he had ever seen. He did not observe D. rotundifolia in this particular bog, however.

ROLF RAWE writes: "I would like to start by complimenting you on the very excellent newsletter put out by you. For its size (and age), I think that it contains the highest concentration of eminently useful material I have come across in any botanical journal, and I subscribe to virtually all the orchid, cactus, and bromeliad societies as well as the Palm Society. I have learned a tremendous amount of cultural information about our plants but to date have, in many cases, not had the opportunity to apply this to many different genera and/or species. This being the reason for this letter, to complain generally about the unavailability of the vast number of Nepenthes, Cephalotus, Heliamphora, and Byblis, though, of course, through no fault of your society."

TREVOR KUCHEL writes: "I am still after seed of the different forms of Sarracenia species and also natural hybrids. I would appreciate it again if you would kindly publish another request for me please. I am interested in purchasing small quantities (preferably collected wild) and wish to hear from private growers only, as I hope to gather some information as well. I have found out that Nepenthes khasiana are available in bulk from Universal Bulb and Plant Nurseries, P. O. Kalimpong, West Bengal, India. The cost is U.S. \$125.00 per 100 plants. F.O.B.. Calcutta Airport. Unfortunately, this is far too expensive for me. I do not know how long this will go on as I was told that recently the government of Assam has banned the collection of these plants for preservation and would be turning the area into a sanctuary. So, it seems that the need for conservation of CP's is recognized in an area where they are commercially stripped. The vernacular name is Tiew-raket meaning demon flower. My address is: P.O.Box 110, Murray Bridge, S.A. 5253, Australia."

COLIN WHITING happily reports to us: "In my article on S. purpurea in Ireland (CPN IV, 54, 1975), I'm afraid I was misquoted--my bad writing, I guess. In fact, far from being threatened by peat cutting, the locals have stopped peat cutting some distance from the site. I mention this to indicate the respect that locals have for the plants. Also, the plants were introduced to other sites at the same time in 1906 but not because the original site was threatened. As I see it, the future for Sarracenia in Ireland is good. I hope to write a fuller account when I revisit Ireland next time."

For those of you who like to hybridize your CP but are frustrated because the flowers of two different plants don't bloom at the same time, SUSAN VERHOEK explains a technique that might work for CP. "The procedure for using frozen pollen is explained in Clayberg, Carl D., 1964. Title: Freeze pollen to make crosses out of season. The Gloxinian 14(1): 18-20.* I have used small jars to hold the silica drying agent and an open shell vial containing pollen (and sometimes anthers, although that makes dehydration more of a problem). Other people put pollen in capsules and use smaller jars for the silica and capsule. I feel that pollen maintains some viability for a year at least, although of course it is better used sooner. This method has been used successfully in at least three semi-tropical genera that I know of, so it should do as well for the carnivorous plants. *Amer. Glox & Gesneriad Soc., Inc., 103 North St., Tewksbury, MA 01876

STEVE KAPA writes: "I've managed to root a stem cutting of Byblis gigantea. Last summer after flowering, the plant put out a side shoot, so I cut the main stem and inserted it without hormone treatment in a barely damp mixture of sand and German peat. This was wrapped in a plastic bag and left in a cool sheltered area outdoors. Periodic inspections showed the cutting was still green, but it remained dormant for one full year before resuming growth, by which time I had lost the original parent stock.

"Drosera trinervia seems to be a winter grower. A small start fizzled very quickly outdoors last summer, yet it spontaneously reappeared during the cold of winter. By early spring it reached full size (1") and flowered. At the end of May the top growth had browned off again. Like several other S. African species it probably forms a thickened root to survive the summer. I suspect that our American D. brevifolia shares this habit. Both species are similar in color, size, and growth habit. When Jimmy Payne collected D. brevifolia in Texas, he found them in abundance during February, but they were almost gone in summer. I grew them in 4" of sand-peat mix, but have not yet tried any other type of medium."

DAVID TAYLOR visited the Botanic Gardens at Oxford, England to view their CP collection. He sent along a few photographs showing a variety of Sarracenia species and hybrids in bloom inside their greenhouse. The plants are growing in large mats of living sphagnum moss in a type of natural habitat setting among the rotted logs, moss covered rocks; and spotted here and there are some Drosera plants. A very nice collection to see.

ED TANAKA writes: "I am a novice CP enthusiast who enjoys and appreciates CPN a great deal. I think the informal format and diversity of articles are appropriate for the general CP audience. However, being a beginner, I would like to see a "Beginner's Corner" where rather basic do's and don't's and how's would be included. Some of the material might be obvious and worthless to experienced CP growers, but for the novice and uninitiated growers, it could be a gold mine. For example, what confuses me is: does it matter all that much whether sphagnum moss (long fiber) is used instead of a 4:1 mix of sand and peat moss? I read about all sorts of different formulas, ratios, and components for mixes in various books, from CPN and from commercial growers. Please help!"

JOE MAZRIMAS says: "I use live sphagnum moss because it is a good indicator for anything that might go wrong with my CP. In fact, sphagnum moss is an excellent cation exchanger-- it grabs onto divalent cations in tap water such as magnesium, calcium, copper, zinc, etc. and releases hydrogen ions. It is for this reason that watering sphagnum with tap water soon builds up salt levels to such a high degree that sphagnum is killed and so is the plant (usually a rare CP). So, as long as sphagnum is watered with water that is low in dissolved salts, the moss stays green and healthy, and so does the particular CP plant that is in it. Even so-called "dead moss" (brown peat moss) is a pretty good cation exchanger but there is no indication here that salts are building up in the medium after a period of time. One must repot the plant in fresh peat moss periodically to assure that the CP plant will continue to grow well. Most CP plants detest high salt levels in the medium and usually do not grow well when watered with water that has a high salt level. Usually, water containing about 25 ppm or less of dissolved salt is suitable for most CP. Live sphagnum moss also indicates moisture content. Moss with low moisture content turns from green to white. Addition of water to the white moss will return it to its green color within a few hours. Thus, one may use sphagnum moss for CP plants that prefer to grow on the dryish side as Byblis and Drosophyllum by maintaining a moss state that is neither very green nor very white but somewhere in between. Everyone has a different living style and I plant my plants in a particular planting medium which requires occasional watering. Since I am very busy, this method utilizes a minimum of my time needed for watering. That's why I use sphagnum moss when I can. Others use mixtures of sand and peat or other exotic mixtures (even commercial mixes for growing African violets) for growing CP but these require more frequent watering to keep up with the growing CP. So, many of the formulas and various mixes you find in books and CPN just reflect what is available to the grower, how much he can spend on growing medium and how much time he wishes to devote to watering and caring for carnivorous plants."

The first annual symposium on carnivorous plants was held on June 2, 1976 at Tulane University in New Orleans, Louisiana, USA. This meeting was part of the annual AIBS meeting (American Institute of Biological Scientists) which took place on the Tulane campus between May 30 and June 4. The symposium was arranged by Dr. Daniel H. Franck of the University of Wisconsin who called upon various scientists with varying interests in CP to give a thirty minute talk about their interests and research to the visiting scientists from all over the country. The CP program was as follows: Speaker and title --

Daniel Franck Comparative Morphology of Tubular Leaves.

The speaker explained the origin of tubular leaves in CP and used Darlingtonia as an example of how these leaves originated from the meristem tissue of the plant. An historical perspective which included the theories of many noted botanists of the past was used to compare the current research to the observations of other scientists. A more thorough review of this subject will appear in a future issue of Biological Review.

Stephen Williams Action Potentials in Carnivorous Plants.

Dr. Williams from Lebanon Valley College described his research on the action potentials of Drosera, Drosophyllum, Aldrovanda and Dionaea in relation to their sensory structures. He also discussed the evolutionary relationships of the genera in respect to the type of sensory apparatus that each one contained from the primitive to the more advanced type. A paper describing this research will appear in the Proc. of the American Phil. Society.

Stuart L. Jacobsen To Catch a Fly: Electrophysiological Explorations of Venus' Flytrap.

The speaker concentrated on the stimulatory response of the sensitive hair on the flytrap in relation to the source of the memory. The interval of time between stimuli and time of trap closure was measured and related to the response from different areas on and about the sensitive hair.

John A. Lindquist Microbiology of Carnivorous Plants.

This talk centered on the microorganisms and their identification as isolated from the pitcher liquor of Sarracenia purpurea in Wisconsin. Among the varied number of organisms (see list in CPN IV, (4), 65, 1975), the presence of the nitrogen-fixing organism Klebsiella was identified but no actual fixation of nitrogen could be detected. Yeasts, molds, algae, protozoa and rotifers were also observed.

Larry E. DeBuhr Phylogenetic Relationships of Sarraceniaceae.

On the family level, the speaker presented evidence that the pitcher plant family Sarraceniaceae is most closely related to the Theales rather than the other carnivorous plant families such as Droseraceae and Nepentheaceae.

Joseph A. Mazrimas Horticultural Aspects of Carnivorous Plants.

A review of the many plant species in cultivation was shown and the significant research results were discussed in relation to seed germination, pollination and various growing mediums for propagation of the rare species of CP.

MICHAEL HOMICK noted an aberrant flower in one of his Drosera rotundifolia. The sepals opened but the petals did not until a day or two later when a plantlet forced its way up between the petals. The leaves of the plantlet form domes at the outer ends with stamens growing downward from the upper part of the dome. Tentacles secreting mucilage grow on the petiole, and some glands were also noted on the sepals.

PHILIP SHERIDAN (5729 S. 2nd Street, Arlington, VA 22204) is looking for a commercial source of live, green sphagnum in quantity.

SHORT NOTES

PEAT, PEAT AND REPEAT by Donald Schnell

The relative value of each of three kinds of "peat" most frequently used by CP growers in their peat-sand mixes--that is, Canadian, German and Michigan peats--has often been discussed in anecdotal terms, each side for each peat often taking very firm stands leading to much confusion. My own impression of the sum and total of these discussions is that very few people recommend using Michigan peat, claiming it is "too rich" and of the wrong physical texture for good CP culture. There are strong adherents to German peat who particularly acclaim a good texture, little breakdown over a year or more of use, minimal surface algal growth and stronger growth in plants transplanted into the material. Users of Canadian peat suggest that the latter is an equivalent of the imported material and see no difference in using either one.

While no simple project is going to completely resolve the question of which peat--if indeed any of these--is best for growing CP, we felt that some basic chemical test results thrown into the hopper of discord might offer some useful information. We used standard quantitative and semi-quantitative (the latter especially with trace elements) soil analysis methods, not to be confused with the little three element kits available in garden shops. Canadian peat studied was 'Premier' brand; German, an unknown import supplied to us by Rich Sivertsen; and Michigan peat was 'Singing Hills' brand. Following are physical and analytical observations:

Canadian peat--In dry state, a pale brown, fibrous moderately coarse material with an aromatic odor. Larger fragments of twigs and roots are mixed throughout the material. Occasional mats of peat are noted which require breaking up prior to mixing. Wet, the peat becomes noticeably darker and the fibrous texture softens; the aromatic odor intensifies.

German peat--In dry state, still lighter brown than the preceding with a coarser fibrous texture and fewer larger twigs and roots. Odor was also aromatic but of a different character. There was much more matting of this peat. Wet, the peat did not darken as much as the preceding nor did the fibrous texture soften as much. Interestingly, during our extraction procedure for chemical analysis, we noted that German peat absorbed 20% more liquid than did Canadian peat.

Michigan peat--In a dry state, a silty black material with an "earthy" odor--fibrous structure very weak. Occasional larger twigs and roots also found; little or no matting. Wet, the peat took on the character of muck or wet silt with no structure.

Differential chemical analysis--The following comparative chart is the result of our analysis:

	Canadian	German	Michigan
pH	4.2	4.4	5.2
Nitrate nitrog.	0	0	20
Phosphorus	15	10	25
Potassium	12	18	12
Calcium	20	20	5500*
Ammonia nitrog.	2	2	2
Magnesium	20	20	20
Manganese	0	0	0
Aluminum	0	0	0
Nitrite nitrog.	0	0	0
Ferric iron	0	0	0
Sulfate	0	0	0
Chloride	6	10	4

Except for pH, numerical values are in PPM.

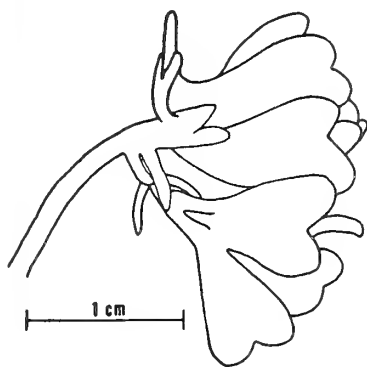
We hesitate to interpret these results too closely since many of the differences are not chemically significant. Our pH method is quite sensitive and obviously Canadian and German peats are more acid than Michigan. Michigan peat is indeed "richer" in the usual horticultural sense in that higher levels of nitrogen (nitrate) and phosphorus are present. Very startling was the large quantity of calcium in Michigan peat; we checked this result with several repeats (no pun intended). We feel that the increased level of potassium in German peat is of borderline significance, but may be of importance in light of current concepts of the function of potassium in certain physiologic processes.

A word of caution: First, sampling is limited since only material from a single batch or bag was used. Secondly, we can only speak for the elements analyzed; there may be many others which in trace amounts could be important, some such as copper, boron and zinc, and others as yet undefined regarding their rolls in plant physiology.

NOTES ON ABNORMAL FLORAL DEVELOPMENT
IN PINGUICULA
by Landon T. Ross

Based on some recent casual observations, abnormal floral development would seem to be rather common in Pinguicula. During a field investigation in Liberty Co., Florida, in February, 1976, flowers were examined in a mixed colony of Pinguicula planifolia and P. ionantha. About twenty specimens of each species were observed and two unusual flowers were noted.

One small individual of P. planifolia (rosette diameter 5.8 cm.), with a single scape, had a small flower (expanded corolla 21 mm. in diameter) with seven corolla lobes and with the calyx lips both three cleft. There are typically five corolla lobes in Pinguicula and the lower calyx lobe is usually two cleft. Other than the multiple perianth parts, the flower was entirely normal.



A moderate sized specimen of P. ionantha (rosette diameter 9.3 cm.) was considerably more unusual. It had three scapes, two of which had normal flowers. The third scape was terminated by two flowers with more or less fused calyces (see illustration). The uppermost flower was not unusual anatomically although it was rotated about 80° counter-clockwise from the usual position, with the spur thus being directed to the right when the corolla was viewed from the front. The lower, second flower was considerably modified. Three relatively well developed spurs were present as well as two short processes on the corolla tube which appeared to be incompletely developed spurs. Two palates were also observed on alternate corolla lobes; one slightly smaller

than usual, and the other only about one-quarter of the normal size. Finally, the second flower was sterile, both male and female organs being absent.

CP FIELD TRIP FROM NORTH CAROLINA TO NOVA SCOTIA

by Richard Cross

In late June of 1975, I journeyed to the east coast on a combination vacation and CP search. Landing in Washington, D.C., my first contact was with Allan Marmelstein. Allan was very informative and inspired me to head south to North Carolina where it was possible to see Dionaea in its natural habitat. So, on June 27, I found myself just west of Morehead City, North Carolina.

As my three companions and I approached the first site Allan had suggested, we were able to observe with ease a phenomenon new to us native Southern Californians and necessary for many CP--that of high temperature and high humidity. The area was a small, moderately open field in the midst of an evergreen forest covered with grasses and sparsely situated shrubs. The field was longer in the north-south direction than in the east-west and was bordered on the south by the paved road on which we had entered the area.

In our initial search of the field, we were only able to find D. capillaris. These were very plentiful, bright red in color and appeared to prefer areas near creek beds (now dry) or the margins of the field where the grass was taller. Soil was sandy in the creek beds; and in the field proper and its margins, soil was sandy with a thin peat covering.

As we prepared to leave the area, we finally noticed a few specimens of D. intermedia in the creek to the east of the field. These were located near the very edge and on the steep banks of the creek bed, but were very few in number. The D. intermedia also had bright red leaf blades and petioles. There were no D. capillaris growing in the vicinity of these D. intermedia although they were present at higher elevations of the bank.

We were returning to the car encouraged by our find, but somewhat disappointed at not having found any Dionaea when we were delighted by a small patch of Dionaea not more than 100 feet from the road. As an added bonus, Pinguicula caerulea was commingled with the Dionaea. The area was about four feet in diameter and the soil was sandy or sandy with a peat covering. Several of the Dionaea had 1-2 foot flower stalks that had set jet black seed. The inside of the traps ranged in color from green to deep red with green being in the definite minority. The plants were closely spaced and formed a small green and red carpet over the ground. P. caerulea was not so abundant as the Dionaea.

We were all in elevated spirits as we departed from the first site, having seen and photographed four species of CP in a relatively small area. We then decided to stop briefly near the road at a second site Allan had suggested in the same vicinity. At this site we were able to find all the species we had found at the first site excepting Dionaea; instead, we found "clumps" of sphagnum moss. These clumps were about six inches above the ground surface and about three feet in diameter. It seemed that P. caerulea had claimed exclusive rights to these sphagnum clumps while D. capillaris and D. intermedia remained at ground level or near the wet roadside gully.

We returned to Washington, D. C. with the idea in mind now of heading north along the coast to Canada. Having read Richard Sivertsen's article (CPN Vol. II, No. 1) among others pertaining to the New Jersey Pine Barrens, I was very much interested in stopping at the Barrens on the way north.

Our first stop in the Pine Barrens was at the Park Office of the Bass River State Forest. When we were unable to locate the abundant Sarracenia purpurea described in Richard's article, we asked at the Park Office for information that would possibly lead us to a stand. We were erroneously told that the only S. purpurea around could be found only near Batso Village in Wharton State Forest approximately twelve miles to the west.

So, the morning of June 20, we found ourselves on a trail leading from the center of the restored village of Batso looking for CP. After searching the area for over an hour, we finally came to an open expanse defined by the surrounding forest and a large stream. The most striking features of the area were the intense reddishness of the soil and the rust-oily look of the water in the stream, both due to the high iron content of the soil in the Barrens. With the use of organoleptic analysis, and assisted by my neophyte experience, I was able to typify soil classification for the area as "damp reddish dirt." A large pond and localizations of small shrubs and grasses comprised the remaining salient features of the terrain.

It was near the pond that we first noticed small mats of D. intermedia. Closer to the stream, we found many more D. intermedia again closely spaced to form mats; but occasionally solitary specimens could be seen. The petioles and leaves of all D. intermedia observed were red. These plants preferred habitats moderately open and interspersed with grass--this as opposed to the bare fifty foot wide banks of the stream or the more densely vegetated areas.

It was particularly fascinating to find that the larger insects, such as dragonflies and craneflies, which were captured in these mats were not held by any single plant but rather by several cooperating plants. Thus, it would seem the close spacing of plants in the mats is a decided advantage to the mat community in that it increases potential victim size.

In the same locale, one could find an occasional lone D. filiformis. These were so few in number that it was hard to define with any certainty their preferred habitat. However, a small majority were found at the edges of the grassy areas and where larger shrubs began growing. In these cases, the plants were usually hidden by the shrub. One of the D. filiformis had put forth a single flower stalk that appeared developed though actual blooming had not yet begun.

Having succeeded in not finding any S. purpurea in the Batso area, we returned to the Bass River State Forest for one last attempt at uncovering any CP. The region we scrutinized was situated at the end of one of the arms of Lake Absegami where a slow moving stream enters the lake. This is also about fifty yards from the same Park Office at which we first stopped. There is a small wood plank walkway that crosses the stream here, but the stream itself is not visible at this point for it is covered entirely by a blanket of green sphagnum moss embedded with pitchers of S. purpurea. The pitchers were very green with no signs of red venation. The green coloration of both the sphagnum and the S. purpurea were most likely due to the reduced light level brought about by the densely populated cedar trees at this locale. The S. purpurea typically had 3-5 long thin pitchers per plant. By pushing the sphagnum away from the base of the plants, several generations of dead pitchers became visible. It was also in this area that we found an occasional patch of D. rotundifolia in the sphagnum and in one case several growing in the tree moss on a log.

We followed the rim of the lake from here towards the main body of water and noted that the concentration of cedar trees was thinning considerably. Now, the stream had taken on the appearance of a large pond dotted by cedar trees. At the base of each tree were large sphagnum mounds with a few S. purpurea. These specimens had the characteristic maroon coloring, and several flower stalks could be seen. As I had no waders, all observations were made from the lake rim; moreover, the privacy of the plants was maintained by some rather nasty thickets. From my restricted perch, it appeared as though the flowers had progressed to the point where their petals had fallen. There were as many as twenty pitchers per plant on several of the specimens sighted.

Following the southern rim of the lake beyond the auto bridge, we found D. rotundifolia, D. intermedia and S. purpurea, generally few in number. The S. purpurea here appeared younger than those noted above, though coloring was maroon. Content with our findings, and with the day's temperature rising, we ended our explorations and headed north.

By July 2, our journey had taken us to Mount Desert Island off the coast of Maine. A large portion of Mt. Desert Island is the Acadia National Park, and among the many enjoyable things to see in the park is the botanical display at Sieur de Monts Spring. The "display" is really a 3/4 acre plot of land in which many plant species indigenous to Mt. Desert Island are grown for the benefit of interested people. According to the self-guided tour pamphlet, Dr. Edgar T. Wherry's book Wild Flowers of Mt. Desert Island was used as a guide in the selection of species. We were surprised to find a small artificial bog in which D. intermedia, D. rotundifolia and S. purpurea were growing. With a few inquiries and a twenty-minute drive we found ourselves at our first peat bog.

The peat bog was a large expanse, measured in miles, west of Hull's Cove on Mt. Desert Island. The entire region was dominated by dense low growing heath vegetation, where the plants were so thick and hearty that they considerably hampered walking. Despite the close proximity to the ocean, the air was hot and humid. If one looked beneath the heath covering, a very dry sphagnum moss could be found. I couldn't help but remember my first tiny bag of sphagnum and now look--miles of sphagnum.

As we looked out across the heath, the familiar red flowers of S. purpurea could be seen here and there. The main plants were not visible, for they were completely covered by the heath plants; only the flowers, now in bloom, could be seen. All the S. purpurea specimens I found had very few pitchers, were green in color, and seemed in poor health. The appearance of poor health might be attributable to the abnormally lengthy time that had elapsed since the last rains. The area of the heath I was exploring had a five yard wide depression approximately four feet deep and fifty yards long. The depression was filled with stagnant water and had a bottom of pure peat.

As this scenario was to be typical of the remaining peat bogs we were to see, a brief outline of peat bog ecology may be in order. A bog begins its life as a lake or series of lakes, often the product of ice sheets from earlier ages. The lake becomes smaller and more stagnant as the surrounding vegetation begins to choke drainage from the lake and surrounding area. Eventually, the stagnant acid water and cool temperatures prevent organic material from completely decomposing, and peat forms. Humic acids are then released by the peat into the water, resulting in the typical coffee brown color.

One of the larger plant constituents of the bog and thereby one of the main sources of peat material is sphagnum moss. As the sphagnum encompassing the lake grows gradually upwards, the great water absorption ability of the sphagnum causes the water table to rise above the lake. The lake in time becomes filled with decaying matter and overgrown by the acidic plants of the bog.

The depression before me was like a cross sectional slice through the bog. I could see clearly the live sphagnum at the surface and the peat below the sphagnum. There were places along the edges of the peat bottom of the depression where live sphagnum grew. Here could be found a few bright red D. rotundifolia. A half dozen or so S. purpurea, including a seedling, also found the depression a desirable habitat.

We examined another peat bog further north at Fundy National Park in Canada. This was actually a self-guided tour entitled "Les marécages et les betes qui y vivent" in French but more briefly in English "Bogs, Bugs and Beasts." There were plenty of all three with bugs being the hands down winner. The Fundy peat bog had a large lake with D. intermedia and D. rotundifolia growing around its perimeter. As with the Mt. Desert Island bog, S. purpurea was present, but here the sphagnum of the heath was light red! The tour was an excellent example of bog ecology and a boardwalk provided a dry platform across the damp heath.

On July 8, we made our last CP and bog stop. This was on the west side of Cape Breton Highlands National Park which is located near the tip of Nova Scotia. The highlands along the west rise to an elevation of about 1,000 feet and at the top of these highlands are seemingly endless heaths. The half mile hike we took to "Benjie's Lake" (a bog lake) I will always associate with extremes: the most northern peat bog visited (47th parallel); the most hot and humid; and plagued with what could have been the most vicious biting flies known to man. Some members of the party still contend that the flies actually bit harder when they detected insect repellent. Again, S. purpurea, D. rotundifolia and D. intermedia were to be found about twenty feet from the lake edge, D. intermedia preferring the wetter locations and S. purpurea in full bloom. Coloring of both Drosera in the region was red. Observations were short and difficult due to the almost continual hand waving required to fend off persistent flies.

South of Benjie's Lake along the main road, the park had contrived a bog exhibit, again with boardwalk and the CP triumvirate. This was a little more accessible to the average traveller and lacking a large body of water had fewer insects.

Though our trip ended in Nova Scotia, we all would have been interested in seeing the vast bogs of Newfoundland to the north--maybe next time. At least we now have some insight into the choice of S. purpurea as the provincial flower of Newfoundland.

PACKAGING CARNIVOROUS PLANTS FOR MAILING

by James C. Fife

Thanks to the Plant and Seed Exchange, we enthusiasts of carnivorous plants are able to establish friends the world over. One of the best ways to begin a friendship, as well as increase your collection, is to ship or receive a package of CPs. But there are certain procedures and techniques which will make the shipping of plants safer and more enjoyable.

Sooner or later, you will be the recipient of a plant package which will be in such a mangled, crushed, destroyed state you'll probably wish it was never sent! However, the reception of a damaged or "destroyed" package doesn't mean the carrier (whether the postal service, parcel delivery agencies, etc.) is to blame. In fact, the damage was probably due to improper packing methods. With the enormous amount of mail and parcels delivered today, the shipper MUST use the best method possible to prevent crushing. Therefore, here are some points to consider before you send a friend a package of CP's:

(1) Decide beforehand exactly what species and the quantity of each species you will send. Try to be generous if possible, as transplant loss is expected occasionally. Never send an "overly generous" supply of plants unless the recipient has informed you of his having ample space to house them. If you've been collecting in the natural habitat, don't forget conservation laws.

(2) Select a very strong cardboard box sufficiently large to safely house the species, corrugated cardboard cartons being the best. Too large a box, however, will not only waste space, cost extra for postage, and give the recipient an illusion of "great expectations", but will increase the likelihood of damage. Remember to allow some room for protective cushioning.

(3) Plants will quickly dehydrate in transit if not wrapped in plastic. Root balls or exposed roots will survive if wrapped in damp peat moss or sphagnum, wrapped in plastic. Never wrap a specimen in newspaper alone, the paper will absorb the moisture and probably desiccate the specimen. Therefore, make sure all damp parts are wrapped in plastic bags or wrap. Wax paper is an excellent substitute.

(4) Tall plants (such as Sarracenias) or ones with easily broken traps or leaves will ship best if sent with strong pieces of cardboard wrapped about them as reinforcement. The exact method of reinforcement is left up to the shipper, but a few moments of thought will reveal the possibilities are unlimited. Attach the wrapped specimen to a piece of flat cardboard; or fold cardboard into a protective sheath for tall pitchers. A stick from the branch of a tree can even be used. Added protection is easily obtained by wrapping the reinforced specimen in newspaper.

(5) Always label each specimen bag, on the outside please. Make sure the label is legible and not smeared by damp fingers. Refrain from placing more than one species in the same specimen bag.

(6) Pack the box. Try to arrange the specimens in such a manner as to reinforce the cardboard box. Open, unused spaces should be filled with crushed newspaper or a substitute cushioning medium. The packed carton should feel solid.

(7) It is always appreciated if a short note or letter is included with the specimen telling what specimens have been enclosed, where they came from, or any special instructions as to their care. Such a note will make the package more enjoyable and personal.

(8) Wrap the box. Use strong wrapping paper, freezer paper (dull side out), or if the box is small enough, you can use a paper grocery bag. Wrap the paper tightly, securing the folds with plenty of strong tape. Don't be stingy with your tape. Then tie thick string or twine about the carton tightly. Attach or print on the address labels, and it is ready to ship.

(9) Select the carrier: (a) Use AIRMAIL or AIR PARCEL POST for all packages sent outside the U.S. When sending plants to another country, check with the recipient as to whether special permits or procedures are necessary. Customs forms are available at the Post Office. (b) AIRMAIL delivery within the U.S. takes the same time for delivery as First Class, and is expensive. United Parcel Service (UPS) is the least expensive and generally takes only three days for delivery. Air Parcel Post is a relatively inexpensive intermediate.

(10) A few cautions: (a) Try to ship packages early in the week to prevent them from sitting dormant over the weekend. (b) Avoid mailing packages during peak holiday rush periods, such as New Year's, Christmas, etc. (c) Never send small plants or cuttings by placing them in an envelope used for mailing. They are not in the least bit protected from crushing, and probably won't survive. Bubble plastic will afford some protection when envelopes are used, but crushing still occurs. Instead, use a small box.

I was told once that it is too time consuming and bothersome to go through all the above trouble each time you send a plant to someone. What is the use in sending your rare plants if they are killed in transit because you were too lazy to take the precautions against their damage!

FEEDING CARNIVOROUS AQUATICS

by T. W. Brokenbro

1. UTRICULARIA -- Many CPNers find much difficulty in obtaining as well as keeping food for aquatic Utricularia (and their close allies Biovularia and Polypompholyx), so the following may be of interest. One food which Utrics readily accept is Daphnia and Cyclops which are easily bred with a little care. First, a culture must be started by placing crushed lettuce leaves and chicken or rabbit manure in a container, such as a bucket, in which there is rain water. This is then stood in strong sunlight and fresh air; the manure and lettuce are removed after two weeks. Fresh air is vital as spores of the infusoria which have dried by the side of some pond will settle into the bucket, in which the Daphnia will eventually feed.

This first process can be speeded up by first boiling the manure/lettuce mixture which is then allowed to cool and age for two or three days. The infusoria culture can then be added by obtaining a half pint of pond water or lake water. (I will exchange CP for a start of the culture if any CPNer wants any.) The bucket must now be given ample sunlight for the infusoria to breed correctly. I would not use bog water since it is too acid to yield a high culture content. This should take a matter of several days when the culture should turn a medium green color and the bottom of the bucket becomes slightly hazy. To check this, just take a drop and place it under a low power microscope and you should see it teeming with freshwater plankton. A visit to the local pet shop will secure your Daphnia and Cyclops although you can obtain them from a pond where there are many species of varying sizes suitable for different sized bladders of Utricularias.

A continuous culture is maintained and this is added to the present bucket as the water level goes down due to normal evaporation. Then as fall approaches, the Daphnia will appear to die off, yet there is no cause for alarm as males will be appearing (females appear only in spring and summer). They mate with the available females producing eggs. These hatch again during spring as heat and light increase thus repeating the process once more.

2. ALDROVANDA -- Young guppies can be bred for this genus by placing adult fish in an aquarium in a ratio of one male to three females. As the fish are live bearers, the new young editions can be prevented from being eaten by their parents by the installation of a breeding trap, from which the young fry can be removed as required to be placed in the Aldrovanda tank. However, don't be tempted to place too many fry into the tank at once as at a certain age they will be able to attack and eat the very plant you are trying to feed. The above can be used successfully with the Utric species which have large bladders. If one can maintain a minimum temperature of 24° C., guppies can also be bred throughout the year supplying a much needed food source when many others are scarce. Also try Brine shrimp which can be obtained in egg form from your local aquarists shop.

3. GENLISEA -- The infusoria culture is ideal for this small plant. Try adding a few drops to its growing medium every so often.

4. ZOOPHAGUS -- The tiny animal called Rotatoria on which this plant particularly feeds should easily be found in pond water after examination under a microscope.

5. ENDOCALHEUS -- This fungus lives by attacking amoeba which it eventually kills. A regular supply of amoeba can be obtained by scooping up a small quantity of the bottom mud of a pond in a wide-necked bottle. If any amoeba are present in this mixture, they will after several days show up as minute gray dots (only just seen by the naked eye) on glass slides. As these one-celled animals live on such life as diatoms and minute green algae, a pond known to be rich in these can supply an ideal food source to breed the creature.

REFERENCES

The Freshwater Aquarium	R. F. O'Connell
Observers Book of Pond Life	John Clegg
Freshwater Life	John Clegg
Carnivorous Plants	Randall Schwartz
Insectivorous Plants	Charles Darwin

DIGESTION PROCESS OF DIONAEA MUSCIPULA AS ANALYZED WITH KIRLIAN PHOTOGRAPHY

by William C. Leikam and Don S. McNeil

Kirlian photography involves the contact exposure of an object with high voltage, not lenses and light. The result is a visible flaring emission pattern extending from the object across the film. This pattern changes in consistent ways as internal changes within the object occur. Such changes might be the emotional state of a person, or the physical condition of a plant, i.e., its state of health. This flare pattern is known by researchers such as Dr. Thelma Moss of U.C.L.A. as the corona.

It was upon this basis of consistent change in the corona that we wondered what changes might become evident upon comparing a series of Kirlian photographs in Dionaea as it proceeded through the digestive process. If we could perceive these concrete changes we surmised that we could then "see" the energy transformations which accompany the digestive function and, therefore, possibly learn something about the digestive cycle. From this information we could then draw several very tentative conclusions about the varying expenditures of energy created and used by the plant, thus allowing us to "see" where peak energy was being produced by the trap in order to further digestion.

DISCUSSION

During our search we ran a double series. Figures 2 and 3 are from series B while figures 1 and 4 are from series A. Each photograph was taken at 24 hour intervals save for figures 1 and 2. Although the photographs actually shown here are from two series, they accurately reflect what was found in each independent sampling.

Thus, figure 1 shows an open trap which was empty but was triggered and closed while in the high voltage field. This figure is used as our baseline for comparison with all successive photographs. Note that the corona in figure 1 is rather mottled through the central region of the trap with a weak corona extending outward on the perimeter. This is characteristic of the energy level, as shown by the corona, while the trap closes without the presence of an insect. Figure 2, however, shows the series B trap within two minutes of closure on a severed common meal worm. Here there is a sudden "exploding" of the corona, but note also that this does not occur evenly about the trap. This unevenness indicates that the greatest flow of energy within the trap region is not evenly distributed, thus possibly suggesting that certain parts of the trap are, at the outset, more immediately and actively involved in both the closure and initial digestive stages than are other areas of the trap and/or that the trap here is seen adjusting to internal stress.

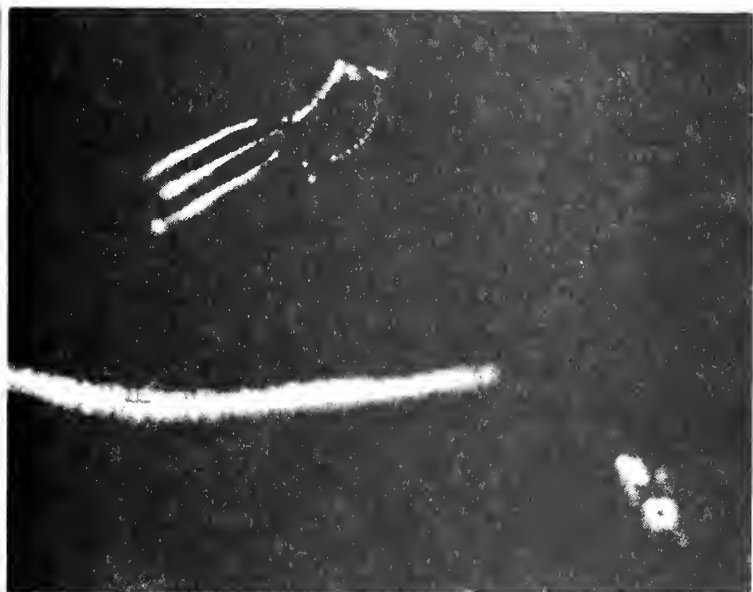


Figure 1

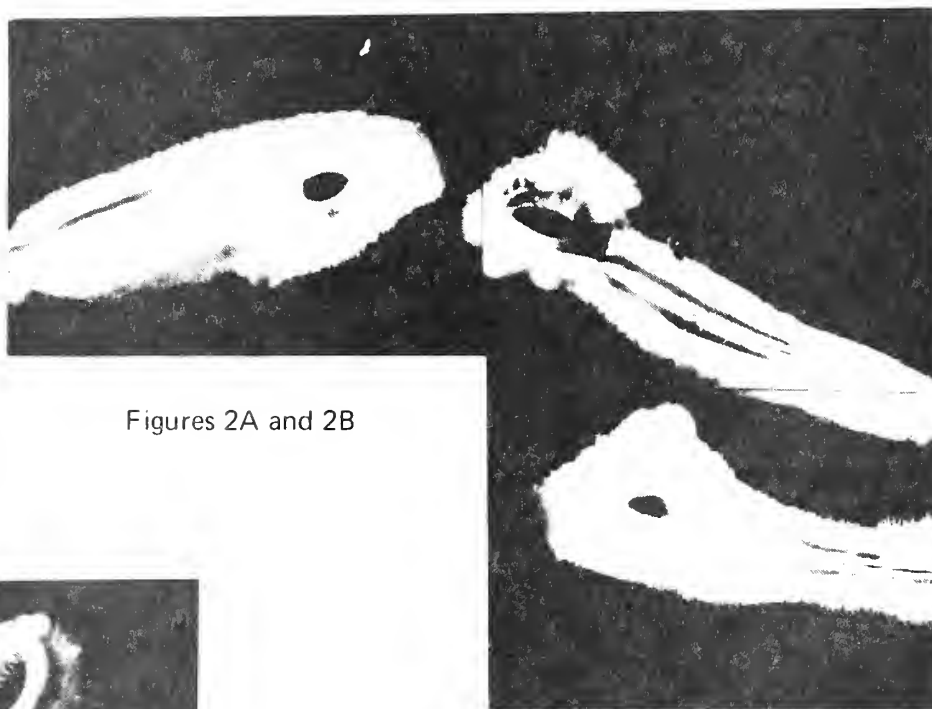
KIRLIAN PHOTOGRAPHY

Dionaea muscipula

(See text for discussion of figures)

W. C. Leikam

D. S. McNeil



Figures 2A and 2B

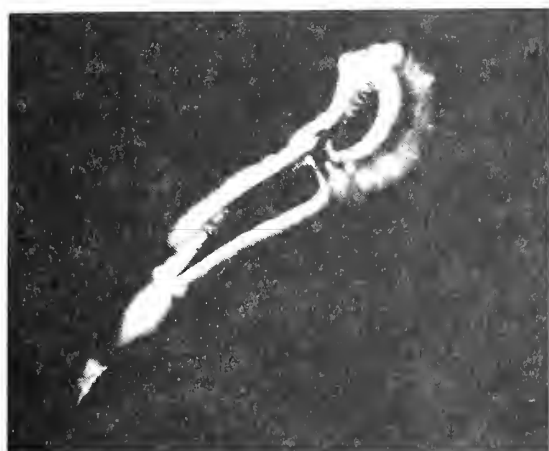


Figure 4

Figure 3

At 24 hours into the process (figure 2A) there occurs a tremendous flow of energy which envelops the total trap and stem in a bright, white corona. This may indicate that at 24 hours into the digestive process the plant is well into its peak activity, thus confirming others' research that there is a large outpouring of enzyme activity and greater cell action occurring in this early stage.

Figure 3, at 36 hours post-closure, shows another change in the corona as compared with figure 2 in that the energy appears to be refocusing itself into the trap and decreasing in the stem. This pattern continues as the process reaches approximately halfway through digestion. However, it should be noted that even as the corona diminishes the total trap and stem begins to take on a freshness, a clarity of detail that is not seen in figure 1. This may indicate three things: (1) that the internal energy needed for digestion occurs with a tremendous and sudden burst which lasts for a period of days and then declines, (2) that actual absorption may not begin until several days after closure, and (3) that apparently the energy needed for digestion and closure once accomplished by the plant then takes on the characteristics of fading which implies that the plant produces very little, if any, new digestive enzymes after about two or three days.

Thus, we see in figure 4, taken just under 24 hours prior to opening, a fully renewed, well fed, and highly refined corona being produced by Dionaea as it returns to its waiting and open state. It is interesting to note the increased vigor in the corona of figure 4, the precise and superbly organized patterns both internally within the trap and externally, indicating a healthy flow of new energy moving throughout the plant. Even a well fed plant reflects the joy of a good meal. And so, here, for the first time as far as we are aware, is a photograph of the energy transformation of a meal worm converted to useful food for the plant.

FINAL NOTE

In doing research with Kirlian photography it is of major importance that the researcher list the materials used and the type of equipment involved, since any change in one of these dimensions will produce variable results. Thus, if another researcher were to check our results the following information would be absolutely necessary:

1. Instrument used: Edmunds Kirlian Photography Unit with modifications.
2. Film: Kodak Ortho Safety Film #3.
3. Exposure Time: 15 seconds.
4. Voltage: High.
5. Photographing Interval: 24 hours per take.
6. Room Temperature: 68-70° F.
7. Humidity: Moderate and constant.
8. Specimen: Dionaea muscipula.
9. Digestive Material: Common meal worm, severed.

SPECIAL NOTICES

STEPHEN WILLIAMS recently published his manuscript titled: "Comparative Sensory Physiology of the Droseraceae--the Evolution of a Plant Sensory System." This manuscript is 18 pages in length and will be published in the Proceedings of the American Philosophical Society. Dr. Williams has made available to CPN members copies of this paper. To offset just his mailing and reproduction costs, he has asked that he be sent 60¢ for each reprint without a cover and 85¢ for a reprint with a cover. This paper deals with the anatomy and function of four genera of CP, namely: Drosophyllum, Drosera, Dionaea and Aldrovanda. Foreign subscribers should add another 40¢ postage for surface mailing. Please send orders to: Dr. Stephen E. Williams, Lebanon Valley College, Department of Biology, Annville, PA 17003. Do NOT send orders to the co-editors.

REGARDING BACK ISSUES of CPN being reprinted and sold by Leo Song as described in the last issue of CPN (p.34), please make all checks for purchase payable to ARBORETUM FOUNDATION FUND and not personally to Leo. See the last issue for price and ordering information.

For those of you who are wondering what is happening to your order for Plants of Prey by Rica Erickson from International Scholarly Book Services, Inc., I should tell you that they are coming after a long delay. A recent call revealed several things. First, the new address is: P. O. Box 555, Forest Grove, Oregon 97116. Their telephone number is (503) 357-7192. At the present time, the CP book Plants of Prey is not in stock but a new shipment is expected to arrive any day which will take care of all back orders and provide sufficient copies for new orders. The new price is \$10.00 postpaid. All orders must be prepaid and bank drafts in U.S. funds are necessary for foreign orders.

For those of you who are interested in ordering reprints of articles from the journal Australian Plants which we mentioned in CPN V, 23, 1976, the issues come fully bound in one volume set. They are \$6.00 plus postage in Australian currency. Write to: Editor, 860 Henry Lawson Drive, Picnic Point, N.S.W. 2213 Australia.

RECENT LITERATURE

Carlquist, S.: Wood anatomy of Byblidaceae. Bot. Gaz. 137: 35-38 (1976)

A detailed description of the qualitative and quantitative features on the secondary xylem of B. gigantea is presented and is found to be similar to that of Roridula, a non-carnivorous plant. B. liniflora has very little secondary xylem and so was not discussed. The author also speculates that Byblis gigantea may not be a carnivorous plant.

Casper, S.J. and Manitz, H.: Contributions to the taxonomy and chorology of the Central European Utricularia species: 2. Androsporogenesis, chromosome count and pollen morphology. Feddes Repert 86(4): 211-232 (1975) IN GERMAN

In U. vulgaris, U. australis, U. intermedia, U. ochroleuca and U. minor, the number of chromosomes is $n=22$. In U. australis and U. ochroleuca, $n=18, 19, 23$ or 24 chromosomes sometimes. The pollen grains of the central European species represent the most derived type of the genus.

Franck, D. H.: Comparative morphology and early leaf histogenesis of adult and juvenile leaves of Darlingtonia californica and their bearing on the concept of heterophylly. Bot. Gaz. 137: 20-34 (1976)

The shoot system of Darlingtonia is characterized by the adult and juvenile leaves which display different ontogenic growth patterns at the earliest stages of initiation. The pattern of venation is significantly different between the two leaf types. The adult leaves show a greater elaboration of the pinnate venation pattern at all stages of ontogeny.

Frowine, S.A.: Growing Carnivores. Light Garden 13:47-52 (1976).

A fine general article with excellent photos, cultural instructions and a list of commercial sources.

Heslop-Harrison, Y.: Enzyme secretion and digest uptake in carnivorous plants. Perspectives in Experimental Biology Vol. 2, Botany, ed. N. Sunderland. Pergamon Press, Oxford (1976).

Jensen, S.R., Nielsen, J.B. and Dahlgren, R.: Iridoid compounds, their occurrence and systematic importance in the angiosperms. Botaniska Notiser 128(1): 181-197 (1975).

Iridoid glucosides have been detected or identified for the first time in many families which included Sarraceniaceae and Roridulaceae. The authors comment on the systemic position of these families.

Juniper, B.E. and Gilchrist, A.J.: Absorption and transport of calcium in the stalked glands of Drosera capensis L. (See above reference) p. 477.

The authors used x-ray-analytical procedures to trace the pathways of transport of specific protein (casein) placed on the glands. Some of the ultrastructural features of gland and stalk cells were unique and previously unreported as it transported the proteins into the plant.

Robbins, R.J.: The nature of the stimuli causing digestive juice secretion in Dionaea muscipula Ellis (Venus' flytrap). Planta 128: 263-265 (1976).

The secretory system in Dionaea was investigated. It was found that secretion of fluid and protein are both stimulated by various nitrogenous small molecules. The author studied these secretions as a function of time.

Sahashi, N. and Ikuse, M.: Pollen morphology of Aldrovanda vesiculosa L. Journ. Japan Bot. 48(12): 374-379 (1973).

The description is essentially in agreement with that of the report given by Erdtman and Chanda with new information given on the operculum and some irregular forms of grain arrangement.

Schnell, D.E. and Krider, D.W.: Cluster analysis of the genus Sarracenia L. in the southeastern United States. Castanea 41:165-176 (1976).

Twenty-six computer cluster analyses were performed on the data matrix derived from grading species and some infraspecies on nineteen characters, some of the latter multi-state. The resulting dendrogram is discussed from a phenetic and evolutionary standpoint. (Reprints: D.E. Schnell, Route 4, Box 275B, Statesville, NC 28677).

Swales, D.E.: An unusual habitat for Drosera rotundifolia L., its over-wintering state, and vegetative reproduction. Canad. Field Natur. 89:143-147. (1975).

D. rotundifolia was found growing in a rather dry habitat on Ile Perrot, Quebec, but soil analysis indicated the same level of infertility typical of more moist Drosera soils, and there was a dearth of competing plants with much open soil surface. There is a discussion and description of winter buds, adventitious leaf budding, and how the plant may possibly have migrated to this location. Excellent line drawings.

Williams, Stephen E.: Comparative sensory physiology of the Droseraceae--the evolution of a plant sensory system. Proc. Amer. Phil. Soc. 120, (3) (1976).

This is a publication of a talk listed previously in CPN V: 16, 1976, in which the author discusses the physiology and evolution of Aldrovanda, Drosera, Drosophyllum and Dionaea's sensory structures.

Williams, Stephen E. and Spanswick, Roger: Propagation of the neuroid action potential of the carnivorous plant Drosera. Jour. Comp. Phys.A (1976) in press.

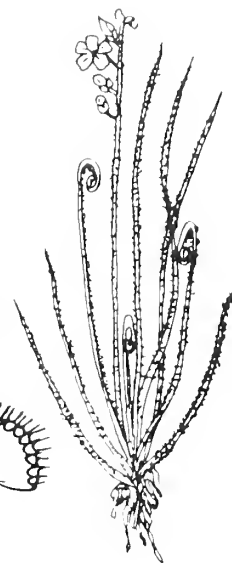
The authors have produced evidence that propagation of electrically induced action potentials are conducted up and down the tentacle stalks by means of low resistance cytoplasmic connections between cells called plasmodesmata. These action potentials occurred at a rate of 4.3 mm/sec down the stalk after a stimulus.



CARNIVOROUS PLANT NEWSLETTER

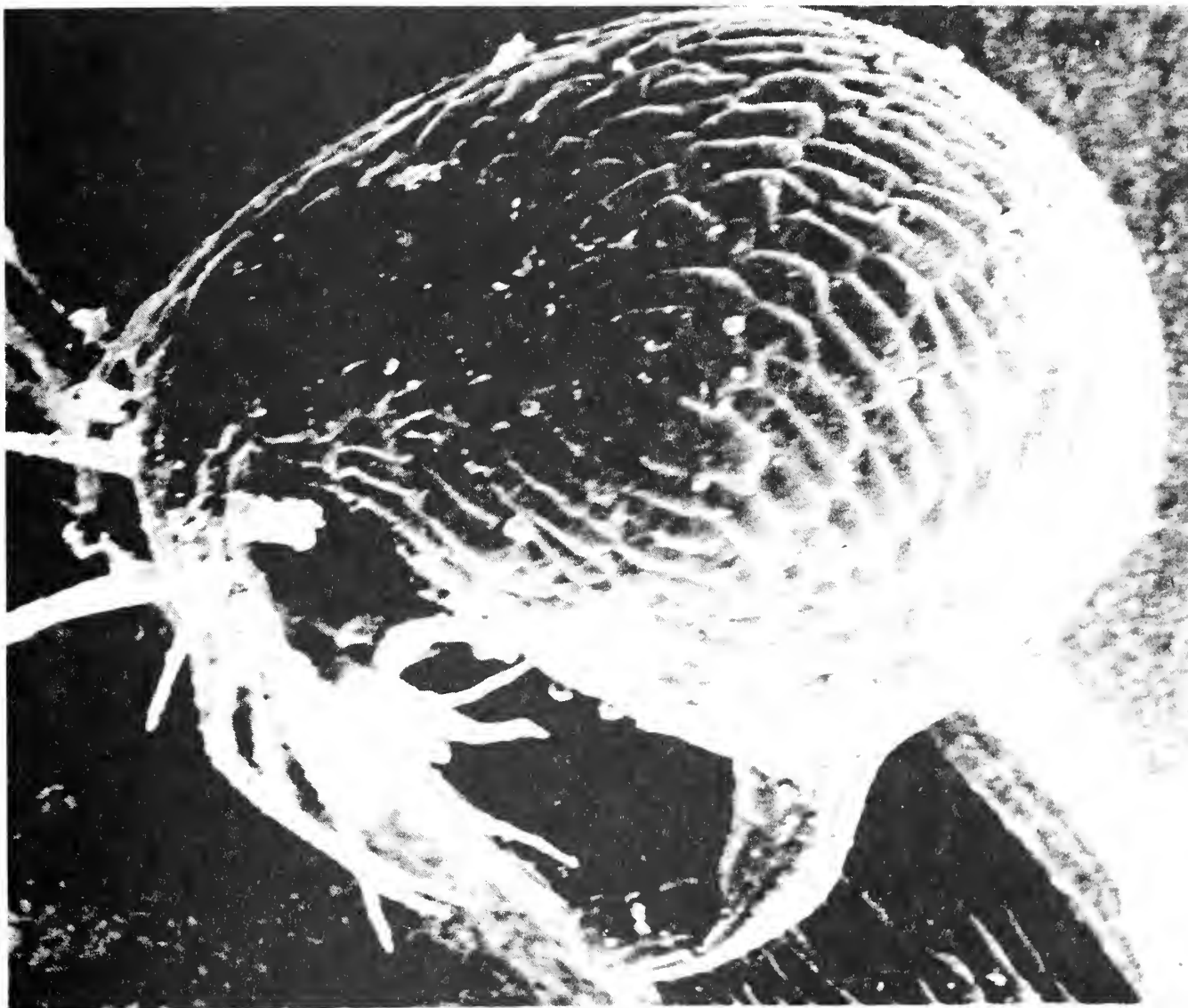
Vol. V, No. 4

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J. A. Mazrimas, 329 Helen Way, Livermore, CA 94550 USA

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Bladder of UTRICULARIA CORNUTA
(SEM 245x)

Preparation and photo by RICHARD M. ADAMS II, with appreciation to Ernest F. Fullman, Inc., Schenectady, NY, who donated several hours of SEM time to a recent pitcher plant project.

FINAL RENEWAL REMINDER -- This is the final notice for renewing your subscription to CPN. Please use the unpaginated coupon at the end of the last issue. Also, be certain to notice the new address for subscriptions and the payee for checks and money orders.

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This issue contains a subscriber address list which we like to publish every two to three years and include in CPN. We feel this helps subscribers keep up with one another. Addresses are dated July, 1976. As a variation, this list is done first by countries and then by zip code for U.S. subscribers, thus allowing the reader to find fellow CPNers in his area. Write either of the co-editors to let us know if you like this kind of listing, prefer straight alphabetical, or would like us to alternate the two types of lists when we publish them every two to three years.

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NEWS AND VIEWS

DAVE DUBOSKY has informed us that Dover Books Publisher has reprinted Lloyd's The Carnivorous Plants in its entirety and original 1942 version. The cost is \$4.50 plus .40 handling. Write: Dover Publications, Inc., 180 Varick St., New York, NY 10014. Dover books are not hardbound, but the covers are more durable than the average "paperback".

KEN PETERSON (145 Chestnut Ln., #211, Richmond Hts., OH 44143) is looking for someone to sell him Cephalotus follicularis and Nepenthes x dicksoniana.

JOE CONTASANO reports that he purchased four Nepenthes khasiana plants and planted two Nepenthes to a pot. Both pots are very large and the plants now are six feet long with eight inch pitchers. The past winter was very cold in Long Island, New York. On some nights the wind-chill factor was 47 degrees below zero F. "The point I am trying to make is that my greenhouse with both heaters going full blast reached only several degrees above freezing, approximately 35 to 40° F. I thought my Nepenthes were lost, but to my delight, all the large ones as well as the smaller plants survived. So, I think that Nepenthes can take cold weather for short periods of time if no wind is actually hitting the plants. This winter I am not going to make the same mistake of having only two small heaters to heat a large greenhouse. Finally, I would like to warn readers of CPN who are growing N. khasiana that they should make sure the greenhouse roof is high enough for the plants to grow."

BARRY BROOKS grows his Nepenthes in North Miami Beach, Florida, in a shade house with open sides. Temperatures there usually reach 90° F. in the afternoon and lower to 78° F. at night with the relative humidity up around 80% in the summer. In the winter, the temperature is usually in the high 60's at noon and drops to a low of 45° F. at night. Frost sometimes hits the area about once every two years. Overall, the yearly temperature range is 45° F. low and 95° F. high. No artificial heat is used at any time. "My Nepenthes do not have to be moved even one day out of the year. I received a small Nepenthes kampfotiana which has grown three feet in one year which proves that I have ideal growing conditions in Miami. All my Nepenthes grow outside like weeds. So far, I have not received Nepenthes that I could not grow, and my collection now consists of twelve species. I recently received a Nepenthes dormanniana from France."

ANDREA HOBBS visited the Sea World display of CP at San Diego last month and was somewhat disappointed in what she saw. Basically, it contained Darlingtonia, Dionaea, and a few common Droseras but all were in stages of decay. She didn't think it was worthwhile either to visit or pay the admission fee just to see the CP display.

JIM KOROLAS sent a brief history of how Sarracenia purpurea became the flower of Newfoundland. One hundred years ago, Queen Victoria chose this plant to be minted on the Newfoundland penny. In 1954, the Newfoundland Cabinet designated the species as the official flower of the province. Jim also mentions that he would like to correspond with Canadian CP growers between ages 14 and 18. He is also interested in purchasing Nepenthes and Cephalotus.

OWEN TALLMAN of SUN DEW ENVIRONMENTS has asked that we inform readers of his new address for mail orders: P. O. Box 111, Denver, NY 12421.

CHUCK KLINE from Sea World in San Diego writes: "We're rebuilding our carnivorous plant exhibit. It attracted a lot of attention and even had requests for TV interviews, newspapers, etc. I needed more light anyway as the display is almost out of daylight by a building entrance. We're also doing a series of graphics explaining the whole thing to people and we hope to have it ready for Thanksgiving time in November."

ROBERT DeFILIPPS sent in two references for the phenomenon of vegetative apomixis in Dionaea as pictured on the June issue cover of CPN: J. W. Harshberger, Contr. Bot. Lab. Univ. PA 1:45-49, pl. 5.6., 1892; and same author in Bot. Gaz. 44: 382-383, 1907.

BARRY JORDAN writes on how to correspond with Russian CP enthusiasts: "You said you would like to know some more Russian equivalents for CP. Well, I have been doing some checking and have found articles on CP in two Russian encyclopedias, one Soviet and the other pre-Revolutionary. So here are some more names for you. Dionaea muscipula has the common name in Russia of venerina mukholovka, a calque on the English "Venus's flytrap" (venerina is the possessive adjective derived from Venera, "Venus" [you've heard about the Soviet Venera space ships that have gone to Venus, no doubt]; and mukholovka is a compound word derived from mukha "fly" and -lovka "trap" [from the verb lovit', "to catch"]). The butterwort is called zhiryanka, from zhir "fat, grease" (cf. Pinguicula, from Latin pinguis). The bladderwort comes out as puzyrchatka, from puzyr' "bladder, blister." And for Drosophyllum Russian has rosolist, a literal translation from the Greek (rosá "dew" [cf. rosyanka "sundew"] and list "leaf"). For the other genera of CP, Russian uses the botanical designation: nepentes "Nepenthes"; al'drovanda "Aldrovanda"; sarratseniya "Sarracenia." One person I talked to suggested kuvshinka for Sarracenia, as kuvshin means "pitcher, jug." As you can see, it fits very well, but unfortunately it turns out that kuvshinka already has the meaning of "water lily." And finally, the Russian generic term for CP is nasekomoyadnye rasteniya (nasekomoe "insect"; yad-, variant of stem yed- "eat"; and rastenie "plant"). So nasekomoyadnye rasteniya is exactly the same as "insectivorous plants."

BARRY BROOKS writes: "You might like to know that I'm giving my Nepenthes plants fish emulsion fertilizer in diluted form once every two weeks and Osmocote every four months. I also found that Cephalotus benefits from a few pellets of Osmocote."

JOHN B. BURNES writes: "As a new subscriber to CPN, I was wondering if this was tried before? I was having trouble getting enough humidity and ventilation in my air-conditioned apartment for Dionaea and Drosera. I covered a 20 gal. aquarium with transparent plastic (Handi-wrap) leaving the corners on the sunny side open about two inches. I connected an old aquarium air pump to an air stone with plastic tubing. The air stone was placed into a quart jar of distilled water (about 2/3 full) inside the aquarium. This moving air and bubbling water seems to have helped my plants greatly since it increased the humidity as well as the ventilation."

JAY BRODIE writes: "This experience took place at a park known as Flander's Nature Center which is located in Middlebury, Connecticut. I went there with my good friend Bob Muller from Torrington, CT, who had a set of maps (aerial and soil) published by the Litchfield County Agricultural Center. This bog consists of two species of CP, namely Sarracenia purpurea purpurea and Drosera rotundifolia. Bob had a chance to visit this bog earlier with his daughter Cheryl but they took the wrong path and consequently did not reach the bog's center. This bog is located about half a mile from where we parked the car. There is a boardwalk extending out about fifty feet and we went crawling and searching for Drosera which we failed to find. However, S. purpurea was plainly visible in vast numbers just out of reach, as luck would have it, with dried remains of flowers with a few containing seed. The sphagnum moss was not very lush and we wondered whether this was because the moss was very wet. The drainage is a slow, sluggish stream at our end of the bog. There is no good way to get out into the bog beyond the boardwalk. The main plants growing there were sedge and leatherleaf, with occasional clumps of low vegetation spaced fairly well apart. The pH of the sphagnum moss and water was strongly acid--about pH 4. The full sun was beating down on the plants since there are no trees in the bog. This accounted for the very crimson color of the Sarracenia. We noticed three types of coloration in the pitcher leaves. The first were green pitchers growing in shade near the bog's edges, the second were pitchers in semi-shade which were green with colored veins. Finally, we spotted dark red pitchers with only spots of green growing in full sunlight. Altogether, it was a rewarding experience that both Bob Muller and I enjoyed. We are currently looking for more such bogs in our area that we can visit."

TERRY BROKENBRO writes: "The Round Robin letter project is coming along very slowly, but I am sure that with a little nudging, more people will join as time goes by. I have listed four RR's so far and also have had some interest from one or two people for 'tuberous Droseras' and other specialized subjects. At the present time, I have participants on record for the following topics: Nepenthes, 3; CP in general, 3; Drosera 3; Seed germination and raising, 2. I am particularly pleased with the latter subject which could prove especially useful to beginners in CP. Also, I would be interested in seeing a R.R. for conservation. Perhaps you could also stress that with a minimum number of eight participants and even allowing for everyone sending the R.R. on the next day that they receive it, members would only see the R.R. every two months at the earliest. For the price of a stamp, I do not think anyone could say this was not money well spent. The subject of plant hybridization is another topic that I am anxious to get started. I am sure many CPN members can provide some useful information on the background of various commercial hybridizations. All this information may eventually go into CPN at a later date. So, for those members who are interested in joining any of the above topics or starting a new one, please write to me soon: Mr. Terry Brokenbro, 37, Laburnham Gardens, Upminster, Essex, Great Britain RM14 1HX."

SPECIAL NOTICES

NEPENTHES CUTTINGS--There is much demand for these and each spring for the past few, Joe Mazrimas and Don Schnell have pooled their prunings (with Joe handling the collation of requests and actual packaging and mailing) and sent them free to those whose requests arrive first, the only reimbursement being postage. The same is planned for the spring of 1977 and requests for cuttings should be made now. The requests will be dated in order of receipt and filled until cuttings supply is exhausted. Send all requests to: J.A. MAZRIMAS, 329 Helen Way, Livermore, CA 94550; do NOT send requests to Don Schnell since this will create confusion, duplication, etc. In your letter to Joe, send along information on what kinds of conditions you can provide for the plants (se we know they will have a good home) unless you and your growing conditions are known. Also, send a list of species of Nepenthes being grown and species desired: the first will prevent duplication, the latter will help us to select plants for you, but final selection will be up to Joe depending on material. You may not receive what you request, but you will not receive duplications. Finally, due to strict import and inspection certificate restrictions, the only foreign countries to which we can send these cuttings will be Great Britain and continental Europe. (Canada, Australia, New Zealand excluded.) Preference will be given to those who have not made requests in previous years. All of this is an attempt to effectively and rapidly spread Nepenthes among growers at no cost except postage. So, if you are interested, get your letter off to Joe today. Cuttings will be made sometime in April and mailed out shortly thereafter.

CURRENT LITERATURE

Adams, R.M. and C. Barton, 1976. The flesh eaters: Sarracenia purpurea, the northern pitcher plant. Garden Journal of NYBG 26(5): 154-157.
A good popular article discussing S. purpurea and its culture. Four fine photographs.

Bradshaw, W. E.: Geography of photoperiodic response in diapausing mosquito. Nature 262, 384-385 1976.

The author studied the photoperiodic control of dormancy in the pitcher-plant mosquito, Wyeomyia smithii, and quantified the relative effects of altitude and latitude on the photoperiodic response of an organism. This mosquito confines its breeding site to the water-filled leaves of a single plant species, Sarracenia purpurea. The larvae overwinter in the pitchers in dormancy and long days promote further development.

Case, F. W. and R. B. Case, 1976. The Sarracenia rubra complex. Rhodora 78:270-325.

This very long paper (at times self-contradictory and repetitious) presents one viewpoint of the "rubra variation" problem, summarized as follows: plants of eastern coastal plain and central Florida panhandle--S. rubra (the author does not believe the Florida plants are genetically different); plants of western Carolinas--re-elevated to species, S. Jonesii; plants of central Alabama--S. alabamensis ssp. alabamensis; plants of southern Alabama--S. alabamensis ssp. wherryi. Serious students of Sarracenia must read the paper in its entirety since such a summary as this cannot present nuances of the concepts proposed. (At least one other paper on this subject is forthcoming in about a year, given journal lag).

Engloff, F.: New and Noteworthy species of Swiss flora. Bull. Soc. Bot. Suisse 84(4): 333-342 1975 IN GERMAN

The author found Utricularia ochroleucra Hartm., Sarracenia purpurea L. as part of a new plant record for Switzerland.

Johnson, Peter H. 1976. Carnivorous Plants. House Plants and Porch Gardens Magazine 1:36-47.

A good general article featuring mainly American plants and including growing hints. There are fifteen full color photos by Jerome Wexler and Don Schnell, and several nice line drawings.

Lea, H.: A muscle contracting substance from a plant's closing fly-trap. Planta (Berl.) 129(1): 39-41 1976

A substance called lysophosphatidic acid was isolated from Dionaea m. traps which have been touched. This substance can contract frog muscle when applied to the isolated tissue. It is thought that the acid activates an enzyme, phospholipase D, which then alters the physiological properties of membranes.

Milne, L. & M.: Living Plants of the World, Chapter 10, "The Meat Eaters." Random House, Inc. N.Y. 1967.

Dear, M. T. and R. Mason: Discovery of Utricularia protrusa Hook., f. near Westport, South Island, New Zealand, N.Z.J.Bot. 13(4): 803-805 1975

The floating bladderwort U. protrusa was found in roadside shallow pools which extends its species range southward by 550 Km.

Panin, M. S. & G. Grishin: Sulfur content in some plants of the Semipalatinsk oblast of the Kazakh SSR. Rastit. Resur. 11(4): 473-483 1975

Utricularia vulgaris was found to contain a relatively high sulfur content in comparison with 60 spp. of other plants.

Robins, R. J.: The nature of the stimuli causing digestive juice secretion in Dionaea muscipula Ellis (Venus's Flytrap). Planta (Berl) 128(3): 263-265 1976

The secretions of fluid and protein are studied as a function of time when both are stimulated by various nitrogenous molecules. Using a new method for collecting the juice, the author found significant differences in response to various stimuli.

Somha, K.: Pollen morphology of the Japanese species of Utricularia L. and Pinguicula L. with notes on fossil pollen of Utricularia from Japan. J. JPN. Bot. 50(6): 164-179; 50(7): 193-208 1975

Pollen types were related to subdivisions recognized in the family of Lentibulariaceae and generally support the De Candolle system. Four species have grains which are tricolporate and the rest are stephanocolporate (11 species). Fossil grains are comparable with those of U. vulgaris followed by U. dimorphantha, minor, aurea, gibba, and intermedia in a proposed phylogenetic outline. Pinguicula ramosa and P. vulgaris both have stephanocolporate pollen grains.

(The author of the following paper would like us to inform our readers that she carried out these experiments at the age of eighteen and won first prize in a science competition ["Jugendforscht"] for young people interested in science.)

Weilbrenner, Inge: Vegetative Vermehrung und Wuchsstoffhaushalt bei dem Rundblättrigen Sonnentau (Drosera rotundifolia)*, Mitteilungen der Pollichia, III. Reihe, 21. Band, 1974, pp. 46-67.

This article deals with vegetative reproduction in Drosera rotundifolia and devotes special attention to the role played by the auxin indole acetic acid (IAA) in suppressing such reproduction. The author shows that for new plants to arise asexually, two basic criteria must be met: (1) Suspension of apical dominance in the parent plant through interruption of IAA translocation from the shoot apex, and (2) A wound stimulus, induced either by mechanical injury or by agents of decay such as bacteria or fungi. The author also presents experimental evidence that in D. rotundifolia the movement of IAA is possible in either direction along stem or petiole, an exception to the one-way flow of IAA in other plants. (Includes bibliography)

*Vegetative development and reproduction in the roundleaf sundew (D. rotundifolia).

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CPN SUBSCRIPTION RENEWAL FORM

(Note -- This will be your only renewal notice; we do not send out individual mailings notifying you that your annual subscription is expiring)

Again this year, CPN has grown remarkably. We thought we had made a generous estimate of the number of subscribers we would have this year but we were caught short once more!-- More subscription requests later in the volume-year than we had earlier issues. We will increase the printing again, this time we hope sufficiently. With CPN's growth has come a tremendous increase in workload for your two co-editors. Correspondence and other matters concerning CPN is taking an increasing portion of our available time, often with the sacrifice of other things that need to be done. So, in order to keep CPN up to par, to in fact improve it from year to year, to provide fresh inputs of new ideas and approaches and perspective, and to help with the editorial workload, we are announcing the addition of two new co-editors who will join Don Schnell and Joe Mazrimas in 1977:

T. L. (Larry) Mellichamp (Dept. of Biology, UNCC, Charlotte, NC 28223) has just completed his PhD at the University of Michigan and is joining the Dept. at UNCC. He is the first professional botanist on our editorial staff, and we will expect him to keep us botanically honest, as it were. Larry has a deep interest in carnivorous plants and a broad, balanced insight of botany in general. One new feature of CPN will be a regular column by Larry covering various botanical scientific or ethical problems for beginners. He will derive his material from past issues of CPN and any suggestions you may wish to write him.

Leo Song (The Arboretum, Dept. of Biology, California State Univ., Fullerton, CA 92634) needs no introduction to longtime CPNers. He has done several short notes, many News & Views paragraphs, and has long enthusiastically supported and contributed to CPN in many ways. Leo is supervisor of the greenhouse facility at his institution and has great horticultural expertise with CP. In response to many requests, Leo will also consider a regular column on problems of growing CP for beginners. Write him your suggestions.

We welcome our two new co-editors and are looking forward to the many ways they will make a bigger and better CPN for subscribers.

And now some grim news. Once more costs and CPN's growth have caught up with us financially. We expect a postal increase again next year, but only a few cents this time. The big items are printing costs, and other costs revolving around typing, handling and mailing. When we were small, we depended on much local volunteer help (it would be impractical to farm it out afar in spite of many generous offers to help), such as Don Schnell's secretary doing the typing of the master for free all these five years. She has generously not indicated a desire to quit this work, but the office work is increasing greatly and she has no spare time even if we offered to pay her. Joe Mazrimas has had the thankless task of keeping subscription records straight. Most of this, including treasurer duties, will now be handled by the Arboretum at Cal State, coordinated by Leo Song. The subscription rate increases listed below are rather tremendous percentage-wise, but that is what cost analysis comes down to, and we suffered many weeks over this problem. The only balm has been the comments by many that they do not know how we have put CPN out at such low prices to begin with, and that they feel it would be worth far more than any of the old subscription rates.

When sending in material for CPN or making any comments or correspondence referable to CPN contents, continue to write one of the four co-editors as you have in the past. Do not send such material to the Arboretum per se. However, all new and renew subscriptions and questions about mailing and receipt of subscriptions should be directed to the Arboretum as we have noted below.

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RR 1 404 VERNON ST
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L DRAZIC
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G. H. NEWMAN
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2 LONGWCCC AVE
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R. E. ENGEL
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L. J. MERRHUFF, JR.
BOX U-43
UNIV CF CONNECTICUT
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912 KLINE BICLCGY TOWER
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NEW HAVEN CT 06520

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DURHAM NC 27706

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BOX 2774
DUKE HOSPITAL
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DECATUR GA 30032

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AUGUSTA GA 30904

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122C WILLLIS AVE
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DR ROBERT K GCDFREY
2021 CPULI NGNE
TALLAHASSEE FLORIDA 32301

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JCHA J GLENNON
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TALLAHASSEE FL 32304

L.T. RCSS
1012 RIDGE RD
TALLAHASSEE FLA 32304

D FISH
DEPT CF ENTOMCLOGY
UNIV CF FLORIDA
GAINESVILLE FL 32601

D GORDMAN
10806 SW 8TH AVE
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T L DAVIS
3538 NW 21 ST
GAINESVILLE FL 32605

J A EAGLE
604 SPRING CREEK DR
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R S INGWERSEN
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26715 SW 157 AVE
HOMESTEAD FLA 33030

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FLORIDA CITY FLORIDA 33030

J ZALARICK
1472 74TH ST OCEAN
PARATHCN FL 33050

C E KAUMAN
1031 NE 23RD PL
PCMPANC BEACH FL 33064

B SEVERY
9860 NE 5TH AVE RC
MIAMI ST-CRES FL 33138

MRS NINA M WDESSNER
FAIRCHILD TROPICAL GARDEN
10901 CLC CUTLER RD
MIAMI FLA 33156

W. E. HELPHREY
1332 NW 188 TERRACE
MIAMI FL 33169

BARRYS CARNIVORES
19811 NE 19TH AVE
N MIAMI BEACH FL 33179

C HENINGTON NURSERY
FLORIDA INTERNATIONAL UNIV
TAMIAPI TRAIL
MIAMI FL 33199

P MCINTOSH
621 ICLEWYLD CR
FT LAUDERCALB FL 33301

W S CRAMER
2709 NE 25 COURT
FT LAUDERCALB FL 33305

M FAIRBANKS
637 HOLLY LANE
PLANTATION FL 33317

E A RIEL
820 HIBISCUS ST
BCCA PATCN FL 33432

A LANIER
901 N GREENE AVE
LAKE WORTH FL 33461

C.J. CATHCART
5439 3 ST E
BRACENTCN FL 33507

K. A. SCHRYVER
210 S PARSONS
BRANDCN FLA 33511

M F BECKNER
736 MYRTLE WAY S
ST PETERSBURG FL 33705

P CASHMAN
RT 1 CREWS LAKE CR
LAKELAND FL 33803

M W EDMONDSON
BOX AT
UNIVERSITY AL 35486

BURTON TRCUP
1211 CARLISLE AVE
GUNTERVILLE ALA 35976

RANDY TRCUP
1211 CARLISLE AVE
GUNTERVILLE ALA 35976

A. E. GCINS
DEPT ZCCLCGY-ENTOMOLOGY
AUBURN UNIVERSITY
AUBURN AL 36830

CARL TAYLOR
121 PEERS ST
MCMINNVILLE, TN 37110

DR HILL
BICRCGY DEPT
HELMONT COLLEGE
NASHVILLE TN 37203

M.T. FOX
1620 BRACSHAW GARDEN RD
KNOXVILLE TENN 37912

S R TIPTON
RT 9 KIMBERLIN HTS RD
KNOXVILLE TN 37920

S MCDANIEL
BOX 2953
MISSISSIPPI STATE MISS 39762

S C ROTH
91B N MAIN
SCHWERT KY 42501

JOHN YOUNGER
92 PRICE AVE
CCLUMBUS OHIO 43201

8.

J. EMRICH 517 EWING ST FREMONT CT 43420	JAMES L RYAN 437 GARNETTE RD AKRON, CT 44313	I THOMAS 2163 ECHO ST FT WAYNE IN 46803	RICHARD TUTTLE 514 E WILLIAMS ANN ARBOR MICH 48104	PR HENRY J DEMINK 2965 EAST LECNARC GRAND RAPIDS MICH 49505
C. CURTIS FRIENDS RECREATING SCHOOL BARNESVILLE, CT 43713	CA CRAWFORD 1131 1/2 MANNING RD HARTVILLE OH 44632	PCASAI NURSERY 435 E CUCK RD FT WAYNE IN 46825	CHRIS WEST 1132 MICHIGAN ANN ARBOR MICHIGAN 48104	WILLIAM S FRAZIER JR BOX 1083 ISU STATION AMES IOWA 50010
S. A. FRCHWIEB 37840 JACKSON RD CHAGRIN FALLS OH 44022	RICHARD MUNKSON AGRICULT. TECH INSTITUTE WCCSTER, OH 44691	M E ADAMS P C BOX 1204 MARION IN 46952	L FALCUMB 10877 BARAGA TAYLOR MI 48180	EG PERSEN 142 GRAY AVE AMES IA 50010
A. MIHALIS 14408 ROCK CREEK RD CHARDON OH 44024	J R WAIR P C BOX 8725 CANTON OH 44711	D BORDEN RT 3 BOX 219 ELCUD KNOXES IN 47119	SAMUEL ALBERT 15081 FAIRCREST DETROIT MICHIGAN 48205	DAVID G THOMPSON 217 RESSEY HALL DEPT OF ECTANY IOWA STATE UNIV AMES, IA 50010
M PELIVAS 5553 BURNS ROAD NORTH CLEVELAND, OH 44070	D. COVERSPIKE 8 WALSH COLLEGE COLLEGE BOX 78 2020 EASTON STREET CANTON, OH 44720	L KILBERT 5601 CCCMER RD WEST BLOOMFIELD MICH 48033	R. C. SANZI 12513 LONGVIEW DETROIT MI 48213	B G STUCKER BOX 47 PLEASANT IA 50573
L A BGYLAN 903 CALEDONIA CLEVELAND OH 44112	D WEBB RT 2 BOX 65 TIFFIN OH 44883	R GARCINER 202 LAKESIDE DR CINCINNATI OH 45205	B. D. KUJAWA 9072 STOUT DETROIT MI 48228	R W LUTZ 1310 ESTHER ST IOWA CITY IOWA 52240
NA JCHASCN 1120 CHESTER AVE APT 237 CLEVELAND OH 44114	J GRCTHAUS 1265 ILIFF AVE CINCINNATI OH 45205	C C PATRICK 94 PCPLAR STREET PCNTIAC. MI 48058	J. F. ROSENTHAL 23470 KENCSEA CARK PARK MI 48237	FRATIG GELSTRAIN 1615 WEST KILBOURN AVE MILWAUKEE WI 53233
G.L. KNEEY 19200 ROSELAND #6647 EUREKA OH 44117	J P UNGER 7814 LCCUTT TE MADRIDIA OH 45243	J LIEP 1475 GRACEDALE ROCHESTER MI 48063	JAMES T CARNS 1627 BIRNEY ST SAGINAW MI 48607	R.M. ALBRECHT 6021 OLD SAUK RD MADISON WI 53705
R CZERNYAN 5800 LAURENT DR #708 PARMA OH 44129	C.R. BOYER P C BOX 251 DARBY STATION DAYTON OH 45420	S KASPER 23700 CARK GLEN SOUTHFIELD MI 48075	C HANESMURTH 210 RICHLAND LN MADISON MI 53705	JCHN LINDQUIST 118 BAUTERICEGGY UNIV OF WISCONSIN MADISON WISCONSIN 53706
K J PETERSON 145 CHESTNUT LN #211 RICHMOND HTS OH 44143	CE KCLR 419 CONCUITT DR MCCREYSVILLE IN 46158	F. A. HARTMAN DEPT OF ECTANY UNIVERSITY OF MICHIGAN ANN ARBOR MI 48104	C NEWELL 2018 F QUICK RD LINCCLA MI 48742	D. G. MEYERS DEPT OF ZOOLOGY PIRGE HALL UNIV OF WISCONSIN MADISON MI 53706
W. P. STOUTAMIRE RICHMOND DEPT UNIVERSITY OF AKRON AKRON, OH 44304	A FINICK JR 3006 98 ST HIGHLAND IN 46322	TL MELLICHAMP ECTANY DEPT UNIVERSITY OF MICHIGAN ANN ARBOR MI 48104	G F SPANGVCLC 610 W SAGINAW LANSING MI 48933	V BARNESNESS P C BOX 3 EAL CLAIRES MI 54701
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D ANDERSON 2409 S GRANGE APT 4 SIDEX FALLS SC 57103	D FOTH 6141 W 55 ST CHICAGO IL 60638	J RICHARDSON 586 WALNUT ST NEW ORLEANS LA 70118	JCHN T CASH 2006 W 43RD, APT 60 HCLSTCN; TX 77018	JAMES BEE 613 E 16TH ST BURLEY ICAHC 83318
REV LCWELL ANDERSON P C BOX 953 HELENA MONTANA 59601	A CRISON 515 W BRIAR PL #401 CHICAGO IL 60657	E WEISS PICKCGY DEPT TLLANE UNIVERSITY NEW ORLEANS LA 70118	JIMMY PAYNE 1450 LYLE ST APT #5 BEAUMONT TEXAS 77701	AARON L DAVIDSON 2920 JUCITH ST SALT LAKE, UT 84106
JIM CHESTER 41C E ASPEN ST BOZEMAN MONTANA 59715	ANN ATKINSON RR 1 BOX 161 TAYLORSVILLE IL 62568	J C FIFE 210 TUDOR AVE RIVER RIDGE LA 70123	CEGAR A MARTINEZ 1439 FULTON AVE SAN ANTONIO TX 78201	MICHAEL K MCGRIFFIN 1177 SCUTH 400 EAST SALT LAKE CITY UTAH 84111
PAUL LCWICK PCX 626 LIBBY MONTANA 59923	ROBERT C FOLKERTS 809 W FAYETTEB SPRINGFIELD ILL 62704	D MUNSTEREIBEL YOUNG ENG CC P C BOX 50327 NEW ORLEANS LA 70150	A STEVENS V 507 TERRELL RD SAN ANTONIO TX 78209	THOMAS C GIBSON DEPT CF BICLCGY UNIV CF UTAH SALT LAKE CITY UTAH 84112
ROBERT GRIESBACH 404 S CUMBERLAND PARK RIDGE TN 38068	DAVE KUTT 901 PEARL MFRCPCLIS, ILL. 62960	J.G. SMITH BOX 22068 LSU BATON ROUGE, LA 70893	GARY JENSEN 752 N 9W #110 SALT LAKE CITY UTAH 84116	MICHAEL SZESZE 1102 1/2 EIGHT AVE SAFFORD ARIZONA 85546
P RINCSKCPF 395 MARVIN PL WHEELING IL 60090	R. M. MATTER 4108 TENGESS ST ST LOUIS MO 63116	B RALES RT 3 SEARCY AR 72143	P F DAVIS 665B INFANTRY PCST RC FT SAW MCUSTCN TX 78234	CONALC WERCER 915 N TYNDALL AVE TUCSON, AZ 85719
N CSBCRN 1441 S 11 AVB MAYAGUE IL 60153	V LORENZ 13201 CLAYTON RD ST LOUIS MO 63131	J.P. FOX 6615 W MARKHAM LITTLF ROCK AR 72205	J B BURNES 1201 MCCRE AVE LANCS ENC--APT 802 PCRTLANC TX 78374	MAKTC MCNDA S U P C BOX 20887 TLCSCN ARIZONA 85720
M.J.P. BUCKLEY BUTTERFIELD CIRCLE FLCSPMCR, IL 60422	MRS M SCHLEBETH 10262 HCBKIRK CR ST LOUIS MO 63137	P LEWIS 844 ACRTF FLCRENCE PL TULSA OK 74110	GRAY LUCAS P C BOX 144 CEDAR PARK, TX 78613	ERICKSENS GREENHCUSE MRS R H ERICMSEN P C BOX 605 CORRALES NEW MEXICO 87048
ROBERT HANINK 3456 186TH ST LANSING ILL 60438	H S WENGER PCX 185R TUNAS MO 65764	R G REESE BOX 1475 5323 HARRY FINES DALLAS TX 75235	R L CUTENREATH ECTANY ANNEX UNIV CF TEXAS AUSTIN ALSTIN TX 78712	ERIM SCHWENDEMAN 1005 GIRARD NE ALBUQUERQUE NEW MEXICO 87106
TEC MCORRISON 81 FIR PARK FCREST ILLINCIS 60466	L FORSTER RT 1 BOX 200XX STILWELL KS 66085	CLYCE HANSEN 711 DAVIC DRIVE TYLER TX 75701	DENVER ECTANIC GARDENS 909 YCRK ST DENVER CO 80206	ROBERT GCTSHELL P C BOX 9291 UNIV STA RENE NEVADA 87507
RICHARD M GLANTZ 225 SHACY LANE DOWERS GROVE ILLINCIS 60515	C JACK 10408 LAMAR CVERLAND PARK KS 66207	CARL NICHOLS P C BOX 852 WCCCVILKE TEXAS 75979	MR VALLC 1620 GREVE ST APT 4 ECLLDER CC 80302	
P BALASSA 36C NUTTALL RC RIVERSTICE IL 60546	G TOWNE APT T-23 JARCINE TERR MANHATTAN KS 66502			

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MR JOHN A CUBE 1100 N 21ST ST LAS VEGAS NEVADA 89101	FRITZ KUBISCH P C BOX 389 CLIVER CITY CA 90230	SCOTT HENDRIX 1317 PARK WESTERN DR #7 SAN PEBRE CA 90732	L E CAVE 7453 DEAN AVE SUN VALLEY CA 91352	JONATHAN M LOYC 1031 FRIAR LN #C POMONA CALIF 91766
HUGH A MCZINGC BOX 8041 RENC NEVADA 89507	PALL YAMAMOTO 5322 JANISANN AVE CLIVER CITY CA 90230	HARRY HANAKI 1380 GRAND AVE LONG BEACH CA 90804	MITCHELL C SEMER 2368 S WINDWARD CIRCLE WESTLAKE VILLAGE CALIF 91361	HUBERT S MANNING 4903 AC ARCSLEY CR TEMPLE CITY CA 91780
KENNETH YAPKOWITZ 1321 KENISTON AVE LCS ANGELES CA 90019	JAMES L PETERSEN 8104 STEWART & GRAY RD DUNNEY CA 90241	CLINTY CF L A ARECLTA AND BOTANIC GARDENS 301 BALCHIN AVE C/C PLANT SCIENCE LIBRARY ARCADIA CALIF 91006	LESLIE MILLER 2601 N BRIGHTEN ST BLURANK CA 91504	RICHARD LITTLE 1307 PINE AVE CARLSBAD CA 92008
ANDREA G FORBES 327 MCCOY ST #216 LCS ANGELES CA 90020	STEVE KAPA 4445 W 137TH ST APT C HAWTHORNE, CA 90250	RICHARD DEWITT 560 W LINDEN ARCADIA CALIF 91006	SIR RANDAL P COLE 1049 AC VALLEY ST BLURANK CA 91505	DENNIS HASTINGS 36 MACISCAN AVE CHULA VISTA CA 92010
J COOPER 1025 WESTWOOD BLVD LCS ANGELES CA 90024	T L ENGELFARDT 2449 VIA ANACAPA PALCS VERDES ESTATES CA 90274	BOB FARMER 4103 LYND AVE ARCADIA CA 91006	C.L. PITTS DVM 11800 VENTURA BLVD SILIC CITY, CA 91604	SCOTT HENDERSON 215 AC CUYAMACA ST EL CAJON CA 92020
DAVID DESCSA 401 CIRCLE DR WEST LCS ANGELES CA 90024	BRUCE AUGUSTINE 7743 MANCHESTER AVE #3 PLAYA DEL REY CA 90291	HENRY E HUNTINGTON LIBRARY AND ART GALLERY SAN MARINO CA 91108	THE PLANT SHOP 11366 VENTURA ELVE AC HOLLYWOOD CA 91604	DIRK W MUNTEAN 3640 GIRL RD FALLBRCK CALIF 92028
GRAY J PCOLE 1256 AMHERST AVE LCS ANGELES CAL 90025	ELISSA YELLIN 354 AMALFI DR SANTA MONICA CALIF 90402	ROBERT A GREEN 7037 INDEPENDENCE AVE CANGA PARK, CA 91303	J A COLLIER 11946 ARMITA ST N HOLLYWOOD CALIF 91605	BILL MCNTELECNE 18114 CLD CCACH RD PCWAY CA 92064
S FETTER 2300 LAUREL CANYON BLVD G L PINYAN LCS ANGELES GA 90046	20440 ANZA #227 TERRANCE CALIF 90503	KEN JUNKOFF 19522 MERRIDY ST NORTHRIEGE CALIF 91324	MRS HELEN M SPICRT 14701 E LCS ANGELES ST BALCHIN PARK CA 91706	CHARLES L KLINE 1404 SAN IGNACIO SCLANA BEACH CA 92075
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MISS LAUREL MCCLELY 1250 N PUNDY CR LCS ANGELES CALIF 90049	MELANIE FARDER 7333 CHIPPEWA CIR PLENA PARK CA 90620	THE PLANT SHOP BOTANICAL GARDENS 18007 TROPICAN STREET PESECA CA 91335	DWAIN CHEEK P C BOX 1024 GARDEN SAN DIEGO, CA 92112	
PETER PRAGER 10923 174 MYRES AVE LCS ANGELES, CA 90064	SCOTTY SIMKINS 6360 TCMINICA CYPRESS, CA 90630	JCH FLAHERTY 1324 PASEC VALLE VISTA CCVINA CALIF 91724	NANCY CARRY 4517 TEXAS ST SAN DIEGO CA 92116	
MICHAEL CM MAST 2599 1/2 GLEN GREEN HOLLYWOOD CA 90068	ACRMAN SEPTEN 2191 CHORAL CR LA HABRA CA 90631	MARTIN J CREHAN 1232 SC BEANIE CCVE AVE GLENDCRA, CA 91740	MARTIN SCHULER 5170 PAXTER ST SAN DIEGO CA 92117	
BRLCE HCCARC 708 AC HUNTLEY #4 LCS ANGELES CA 90069			JERRY PALCINC 10709 LINDEN AVE BLCCMINGTON CA 92316	

MARK PERRY 17564 SANTA ANA PLCCWINGTON CA 92316	RAYMOND M REINHARD 20332 ADRIAN CIRCLE HUNTINGTON BEACH CA 92646	RONALD CCMP 868 UPHAM ST SAN LUIS CRISPC CALIF 93401	W WCCD 11408 SAN PABLO AVE EL CERRITO CA 94530	DAVID GRABER 2241 JEFFERSON ST BERKELEY CA 94703
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ARCEFTUM SOCIETY INC RILEY DEPT CALIF STATE UNIVERSITY FULLERTON CA 92634	CHRIS A BEARD 211 SC BEACH BLVD 47 ANAHEIM CA 92804	GLEN M KINGSTON 566 36TH AVE SAN FRANCISCO CA 94121	JIMMY CALLAGHER 34835 LILAC CT UNION CITY CA 94587	ROBERT W ALLISON JR 4950 FOWLES LN SAN JOSE CA 95118
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12.

CRAIG WASSON
1305 PEARL ST
MCDESTIC CA 95350

PILL MIKUS
4621 UNION ST
EUREKA CA 95501

PICLOGICAL SCIENCES GREENHOUSE
HUMBOLDT STATE UNIVERSITY
ARCATA CA 95521

ROBERT ZIEMER
1740 STEWART AVE
ARCATA CA 95521

ROBERT R KIMSEY
61 ARTIS LA
DAVIS CA 95616

BRIAN SPAHR
3746 BAINBRIDGE CR
N HIGHLANDS CA 95660

JONATHAN PATTERSON
50001 48TH ST
SACRAMENTO CA 95820

GEORGE PAGENKOPF
633 PCANZA CR
SACRAMENTO CA 95842

TIMOTHY DEVINE
1910 SALEM ST
CHICO CA 95926

OCRAUNA TCGNCTTI
P C BOX 125
MARKLEEVILLE CA 96120

O TOWNSLEY
P C BOX 278
ELELF 11 96705

JERROLD G BROWN
400 HERRON LANE #3110
HONOLULU HAWAII 96815

CHARLES G RAIMONCI
2047 N W 33RD AVE
PORTLAND OREGON 97210

RON SCHUBERT
9485 S W 70TH
PORTLAND CR 97223

CINCY FEINLEIN
P C BOX 5304
SALEM, CR 97304

DR EDWARD ANDERSON
DEPT OF BIOLOGY
WHITMAN COLLEGE
WALLA WALLA WASHINGTON 99362

CARL MCNTGCMERY
200 S W 53RD SP #38
CCRVALIS CR 97330

CLINN AIKENS
3470 MCWILLAN ST
EUGENE OREGON 97405

BARBARA KNOGHT
PCX 363 SRS
YACHATS OREGON 97498

CCUGLAS BURIC
968 GARDEN WAY
ASHLAND CR 97520

RICHARD MARTIN
19330 7TH W
ALDERWOOD MANOR, WA 98036

DAVID SANFORD
4525 FOREST AVE SE
MERCER ISLAND WASH 98040

PLANTS ALIVE
EDITORIAL OFFICE
5509 1ST AVE S
SEATTLE WA 98108

PHILLIP ERICKSON
2612-1ST AVE W
SEATTLE WASH 98119

DEANIS MCCABE
DEPT OF PCTANY
U OF WASHINGTON
SEATTLE WASH 98195

ROBERT L WALLACE
DEPT OF ZOOLOGY
UNIV OF WASH NJ-15
SEATTLE WASH 98195

BOYC SHIRLEY
10213 61 AVE E
PLYMOUTH WA 98371

ACCLPH FECT
DEPT OF PCTANY
WASHINGTON STATE UNIVERSITY
PULLMAN WASH 99163

